US011882508B2

(12) **United States Patent**
Bacinschi et al.

(10) **Patent No.: US 11,882,508 B2**
(45) **Date of Patent: Jan. 23, 2024**

(54) **DATA PROCESSING SYSTEM FOR SMART DEVICES**

(71) Applicant: **SAP SE**, Walldorf (DE)

(72) Inventors: **Radim Bacinschi**, Vancouver (CA); **Ian McAlpine**, North Vancouver (CA); **Edward Yan**, Richmond (CA)

(73) Assignee: **SAP SE**, Walldorf (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 340 days.

(21) Appl. No.: **16/900,795**

(22) Filed: **Jun. 12, 2020**

(65) **Prior Publication Data**

US 2021/0295665 A1 Sep. 23, 2021

Related U.S. Application Data

(60) Provisional application No. 62/993,545, filed on Mar. 23, 2020.

(51) **Int. Cl.**

H04L 67/12	(2022.01)
G16Y 40/10	(2020.01)
H04W 4/60	(2018.01)
H04Q 9/00	(2006.01)
H04W 4/024	(2018.01)
H04W 4/33	(2018.01)
H04W 8/18	(2009.01)
G08B 7/06	(2006.01)
G16Y 20/10	(2020.01)
G16Y 10/80	(2020.01)
G16Y 40/50	(2020.01)

(Continued)

(52) **U.S. Cl.**
CPC ***H04W 4/60*** (2018.02); ***G06Q 90/205*** (2013.01); ***G08B 7/062*** (2013.01); ***G08B 17/06*** (2013.01); ***G16Y 10/80*** (2020.01); ***G16Y 20/10*** (2020.01); ***G16Y 40/10*** (2020.01); ***G16Y 40/50*** (2020.01); ***H04L 67/12*** (2013.01); ***H04Q 9/00*** (2013.01); ***H04W 4/024*** (2018.02); ***H04W 4/33*** (2018.02); ***H04W 8/18*** (2013.01); *H04Q 2209/823* (2013.01)

(58) **Field of Classification Search**
CPC H04L 67/12; H04L 67/306; H04L 67/52; H04L 67/55; G16Y 10/80; G16Y 20/10; G16Y 40/10; G16Y 40/50
See application file for complete search history.

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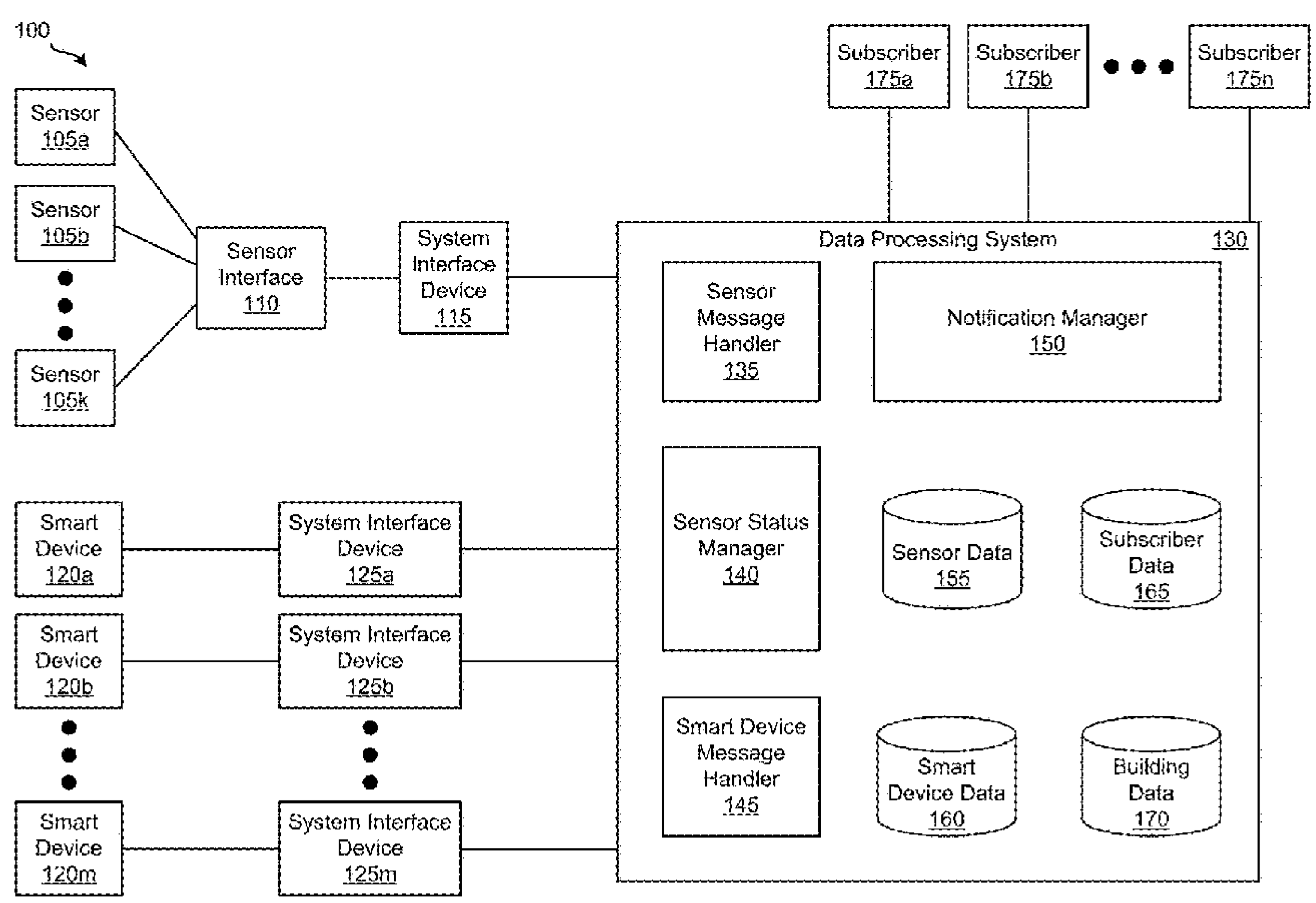
Primary Examiner — Jason D Recek
(74) *Attorney, Agent, or Firm* — Fountainhead Law Group P.C.

(57) **ABSTRACT**

Some embodiments provide a non-transitory machine-readable medium that stores a program. The program receives sensor data from a set of sensors. Each sensor in the set of sensors is configured to sense a physical quantity in an environment. Based on the sensor data, the program further determines a set of configurations for a set of smart devices. The set of smart devices includes a set of smart emergency devices installed in a building. Each smart emergency device in the set of smart emergency devices is configured to provide emergency exit information to guide exiting the building. The program also sends the set of configurations to the set of smart devices.

20 Claims, 12 Drawing Sheets



(51) **Int. Cl.**

G06Q 90/00	(2006.01)
G08B 17/06	(2006.01)

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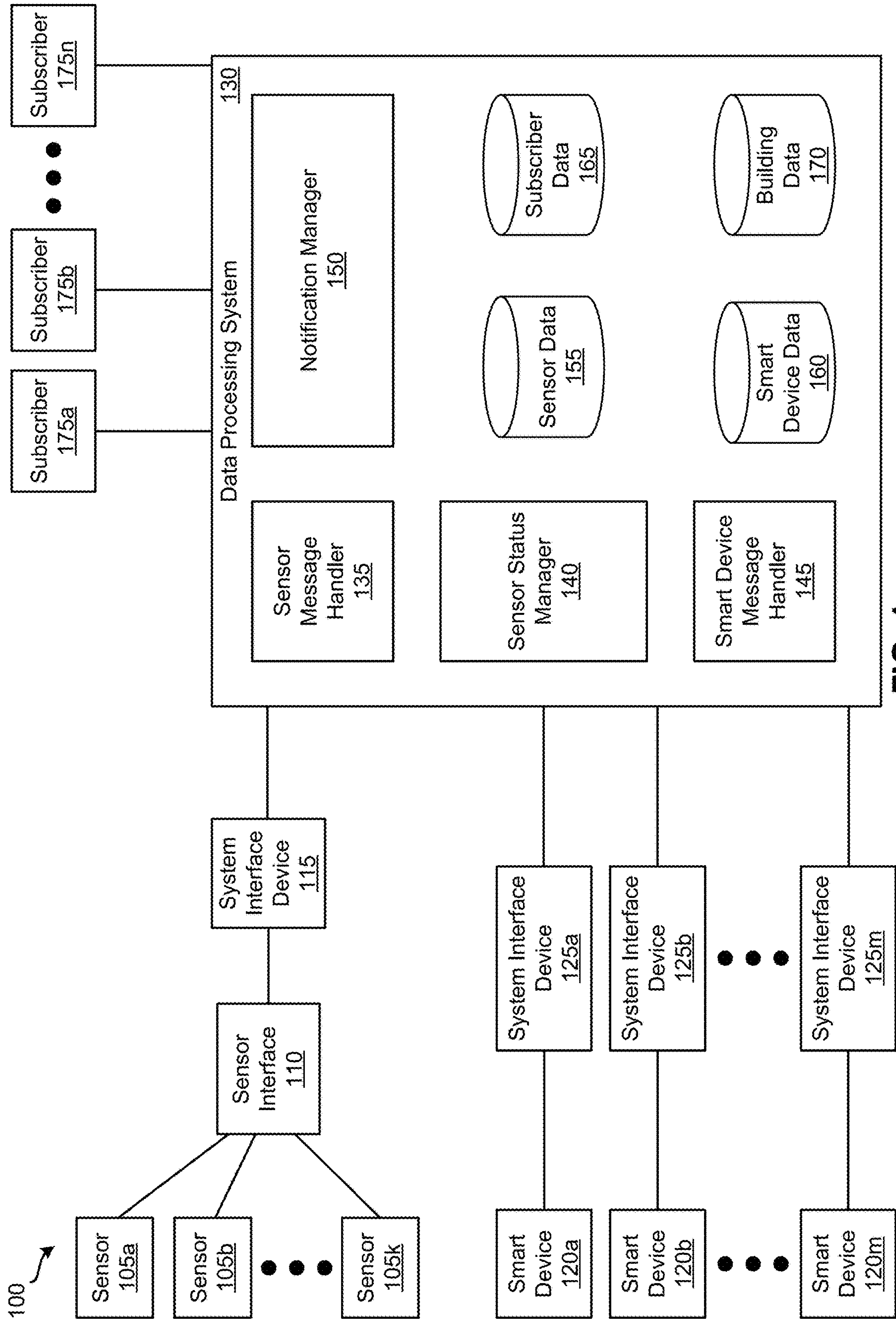
100
Sensor 105a
Sensor 105b
Sensor 105k
Sensor Interface 110
System Interface Device 115
Smart Device 120a
Smart Device 120b
Smart Device 120m
System Interface Device 125a
System Interface Device 125b
System Interface Device 125m
Data Processing System 130
Sensor Message Handler 135
Sensor Status Manager 140
Smart Device Message Handler 145
Notification Manager 150
Sensor Data 155
Smart Device Data 160
Subscriber Data 165
Building Data 170
Subscriber 175a
Subscriber 175b
Subscriber 175n

FIG. 1

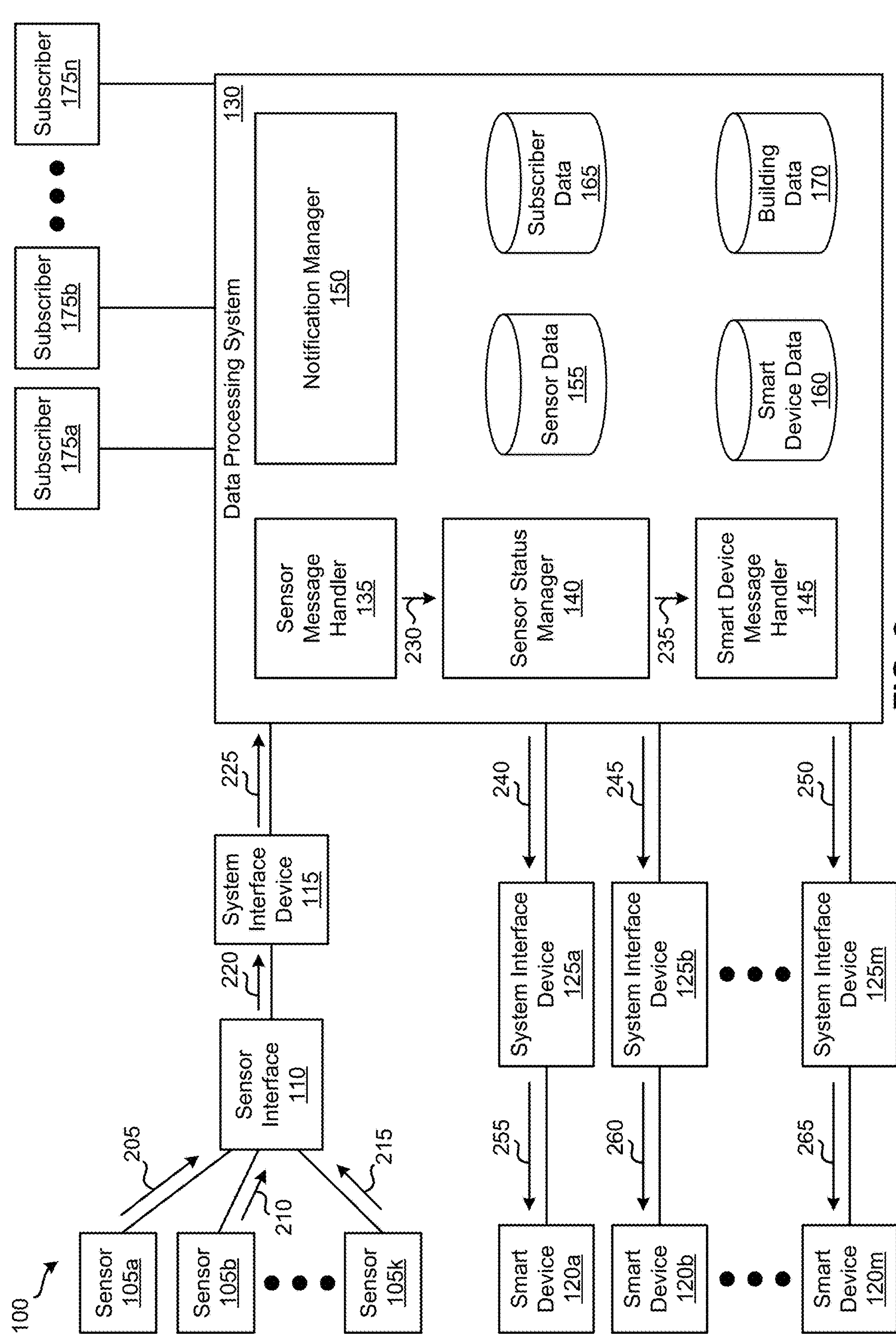
100
Sensor 105a
Sensor 105b
Sensor 105k
205
210
215
Sensor Interface 110
220
System Interface Device 115
225
Data Processing System 130
Sensor Message Handler 135
230
Sensor Status Manager 140
235
Smart Device Message Handler 145
Notification Manager 150
Sensor Data 155
Smart Device Data 160
Subscriber Data 165
Building Data 170
Subscriber 175a
Subscriber 175b
Subscriber 175n
240
245
250
System Interface Device 125a
System Interface Device 125b
System Interface Device 125m
255
260
265
Smart Device 120a
Smart Device 120b
Smart Device 120m

FIG. 2

300

Sensor 1	Sensor 2	Sensor 3
Fire	No fire	No fire

FIG. 3A

300

Sensor 1	Sensor 2	Sensor 3
Fire	No fire	Fire

FIG. 3B

400

Sensor 1	Sensor 2	Sensor 3	SD 1	SD 2	SD 3
No fire	No fire	No fire	Green	Green	Green
Fire	No fire	No fire	Red	Green	Green
No fire	Fire	No fire	Green	Red	Green
No fire	No fire	Fire	Green	Green	Red
Fire	Fire	No fire	Red	Red	Green
No fire	Fire	Fire	Green	Red	Red
Fire	No fire	Fire	Red	Green	Red
Fire	Fire	Fire	Red	Red	Green

405 (points to the row "Fire | No fire | Fire")

FIG. 4

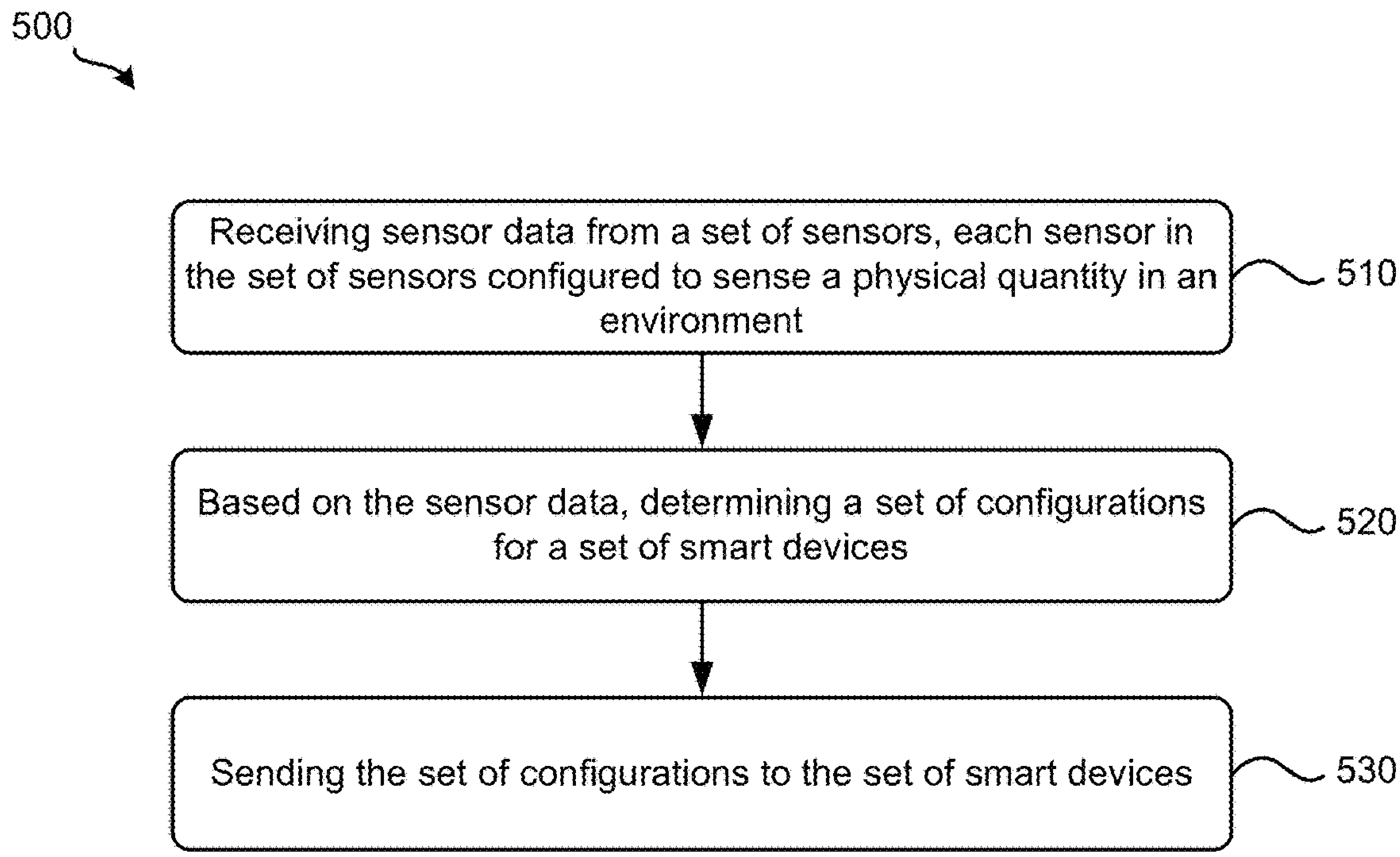
500
Receiving sensor data from a set of sensors, each sensor in the set of sensors configured to sense a physical quantity in an environment
510
Based on the sensor data, determining a set of configurations for a set of smart devices
520
Sending the set of configurations to the set of smart devices
530

FIG. 5

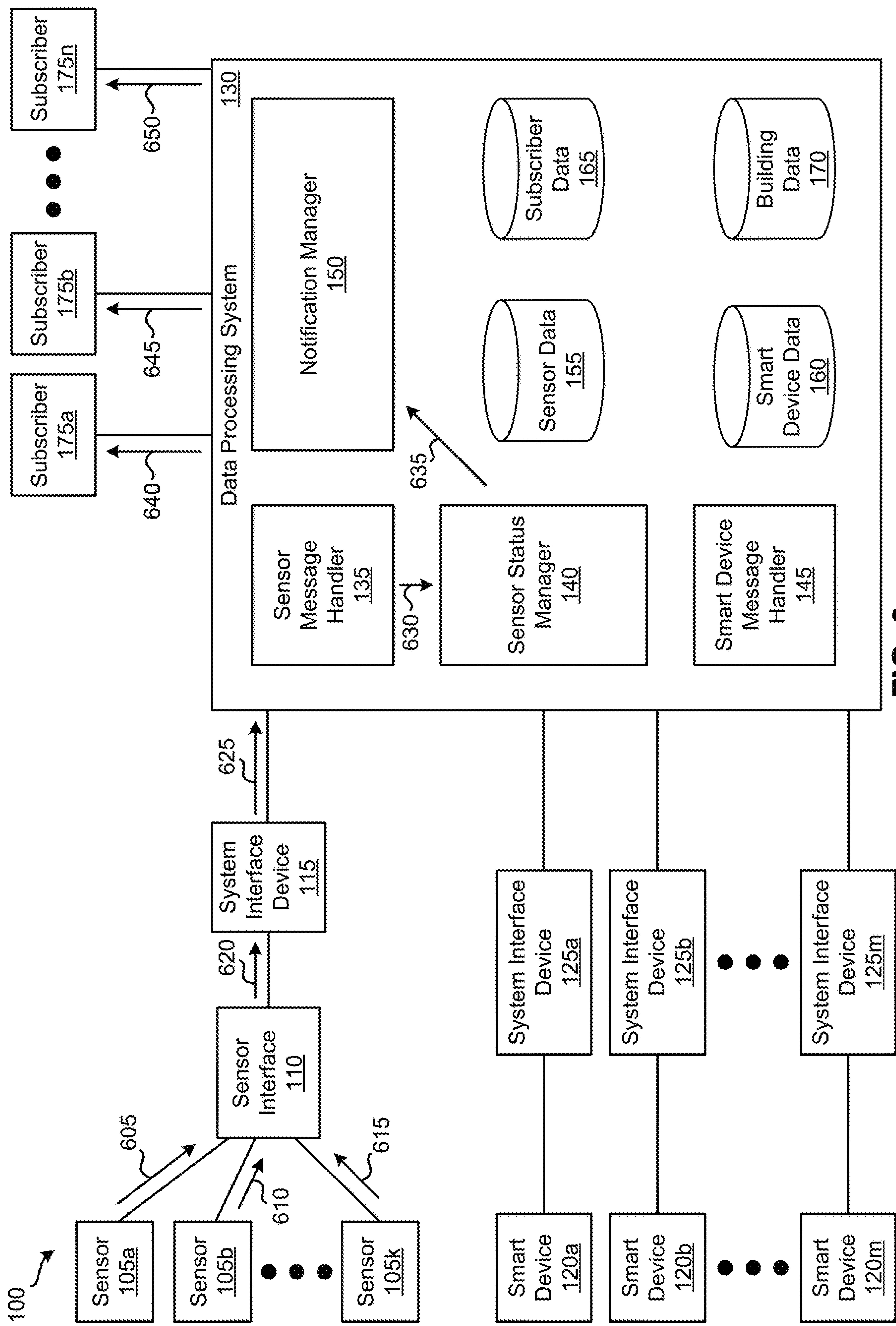
100
Sensor 105a
Sensor 105b
Sensor 105k
605
610
615
Sensor Interface 110
620
System Interface Device 115
625
Data Processing System 130
Sensor Message Handler 135
630
Sensor Status Manager 140
635
Notification Manager 150
Smart Device Message Handler 145
Sensor Data 155
Subscriber Data 165
Smart Device Data 160
Building Data 170
640
645
650
Subscriber 175a
Subscriber 175b
Subscriber 175n
Smart Device 120a
Smart Device 120b
Smart Device 120m
System Interface Device 125a
System Interface Device 125b
System Interface Device 125m

FIG. 6

700

Sensor 1	Sensor 2	Sensor 3
No fire	No fire	No fire

FIG. 7A

700

Sensor 1	Sensor 2	Sensor 3
No fire	Fire	No fire

FIG. 7B

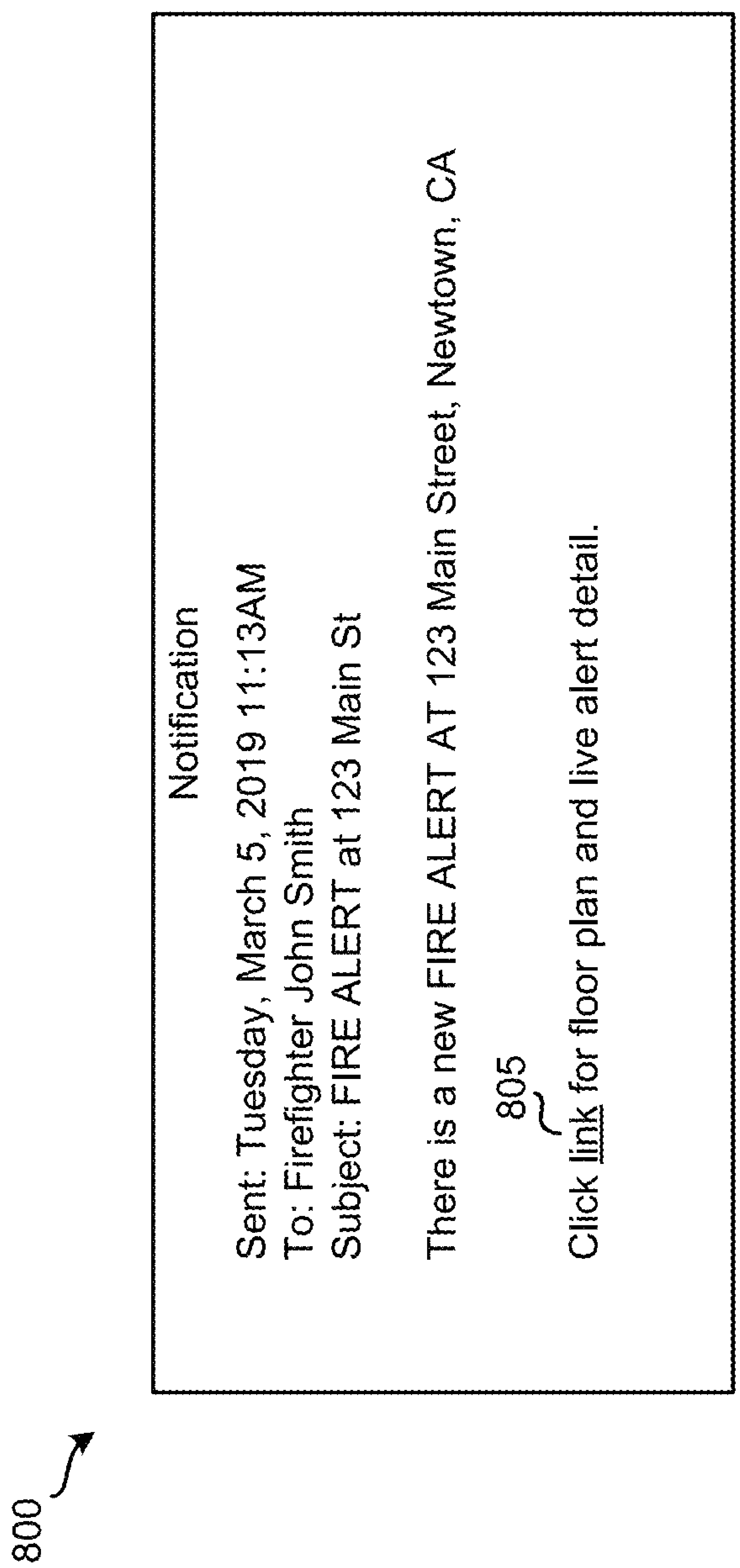
Notification
Sent: Tuesday, March 5, 2019 11:13AM
To: Firefighter John Smith
Subject: FIRE ALERT at 123 Main St
There is a new FIRE ALERT AT 123 Main Street, Newtown, CA
805
Click link for floor plan and live alert detail.
800

FIG. 8

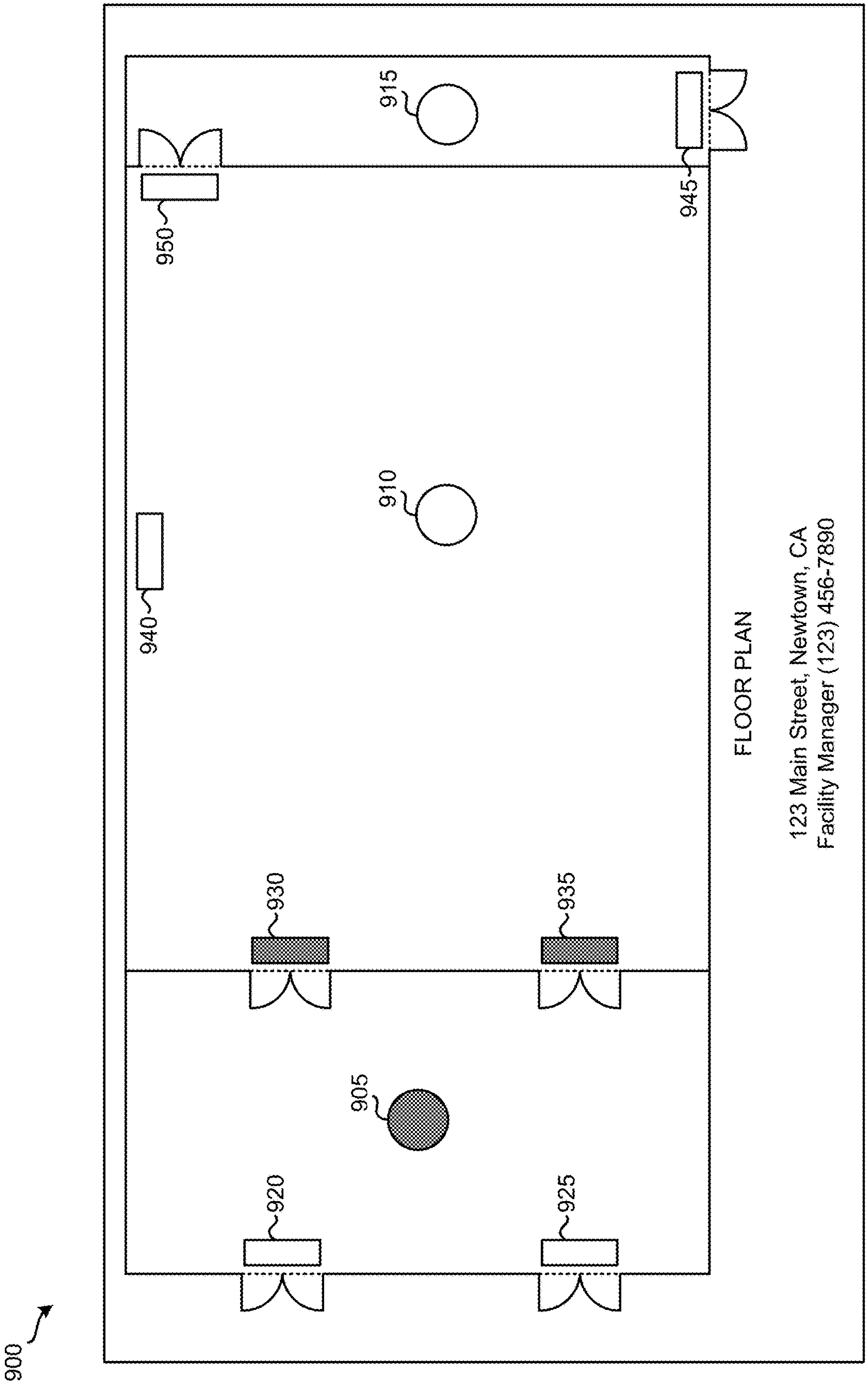
900
905
910
915
920
925
930
935
940
945
950
FLOOR PLAN
123 Main Street, Newtown, CA
Facility Manager (123) 456-7890

FIG. 9

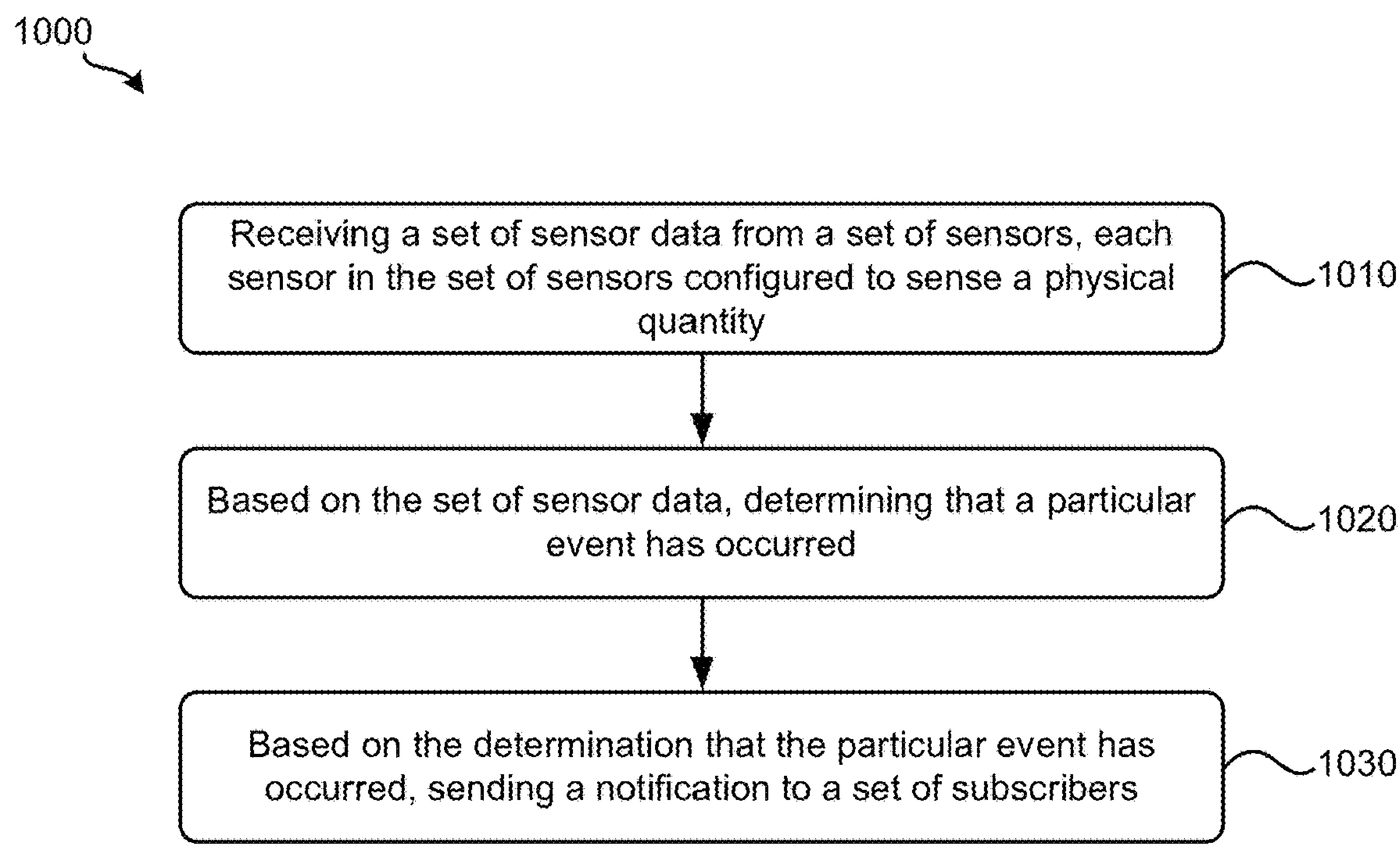
1000
Receiving a set of sensor data from a set of sensors, each sensor in the set of sensors configured to sense a physical quantity
1010
Based on the set of sensor data, determining that a particular event has occurred
1020
Based on the determination that the particular event has occurred, sending a notification to a set of subscribers
1030

FIG. 10

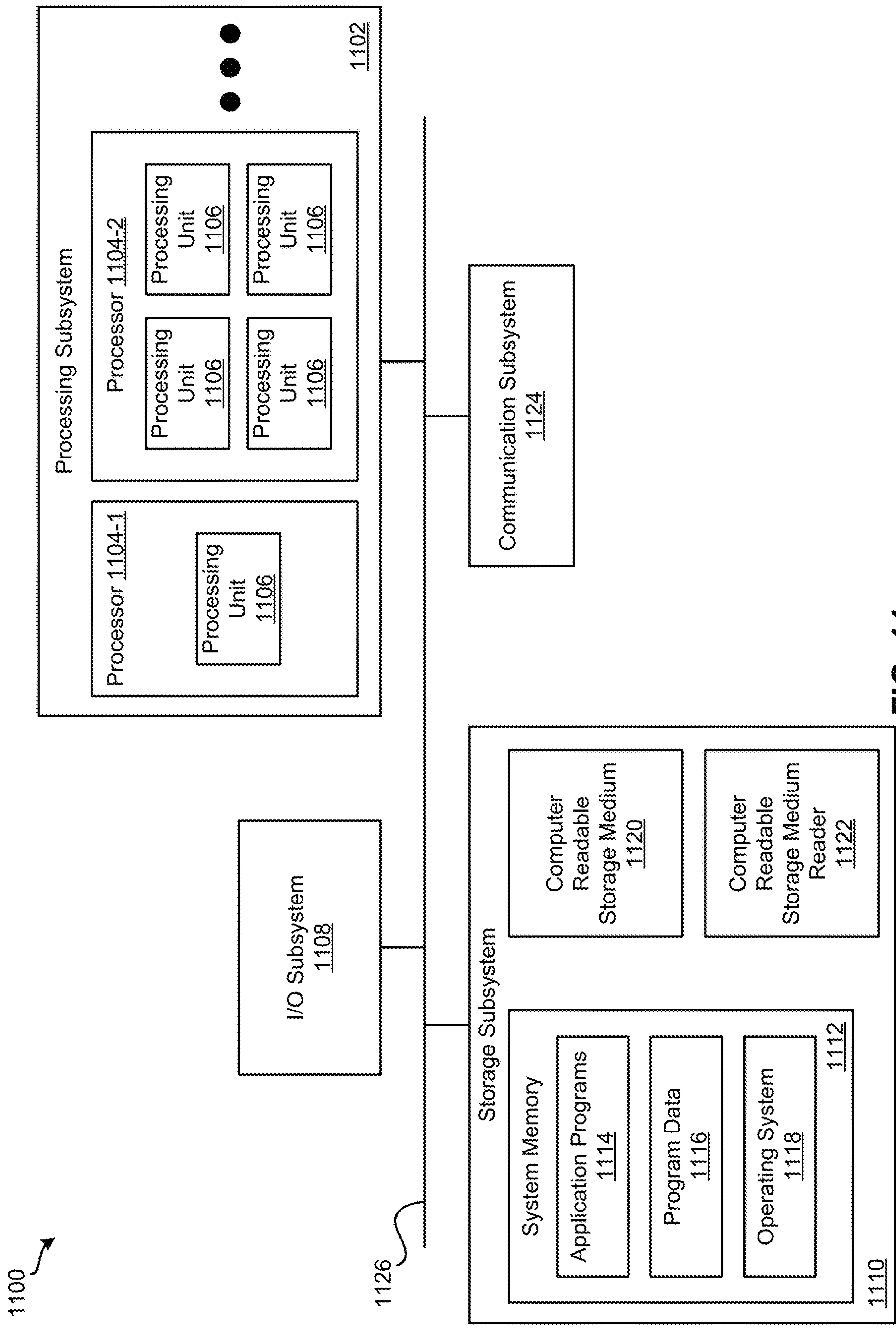
1100
Processing Subsystem
1102
Processor 1104-1
Processing Unit 1106
Processor 1104-2
Processing Unit 1106
Processing Unit 1106
Processing Unit 1106
Processing Unit 1106
Communication Subsystem 1124
I/O Subsystem 1108
1126
Storage Subsystem
1110
Computer Readable Storage Medium 1120
Computer Readable Storage Medium Reader 1122
System Memory
1112
Application Programs 1114
Program Data 1116
Operating System 1118

FIG. 11

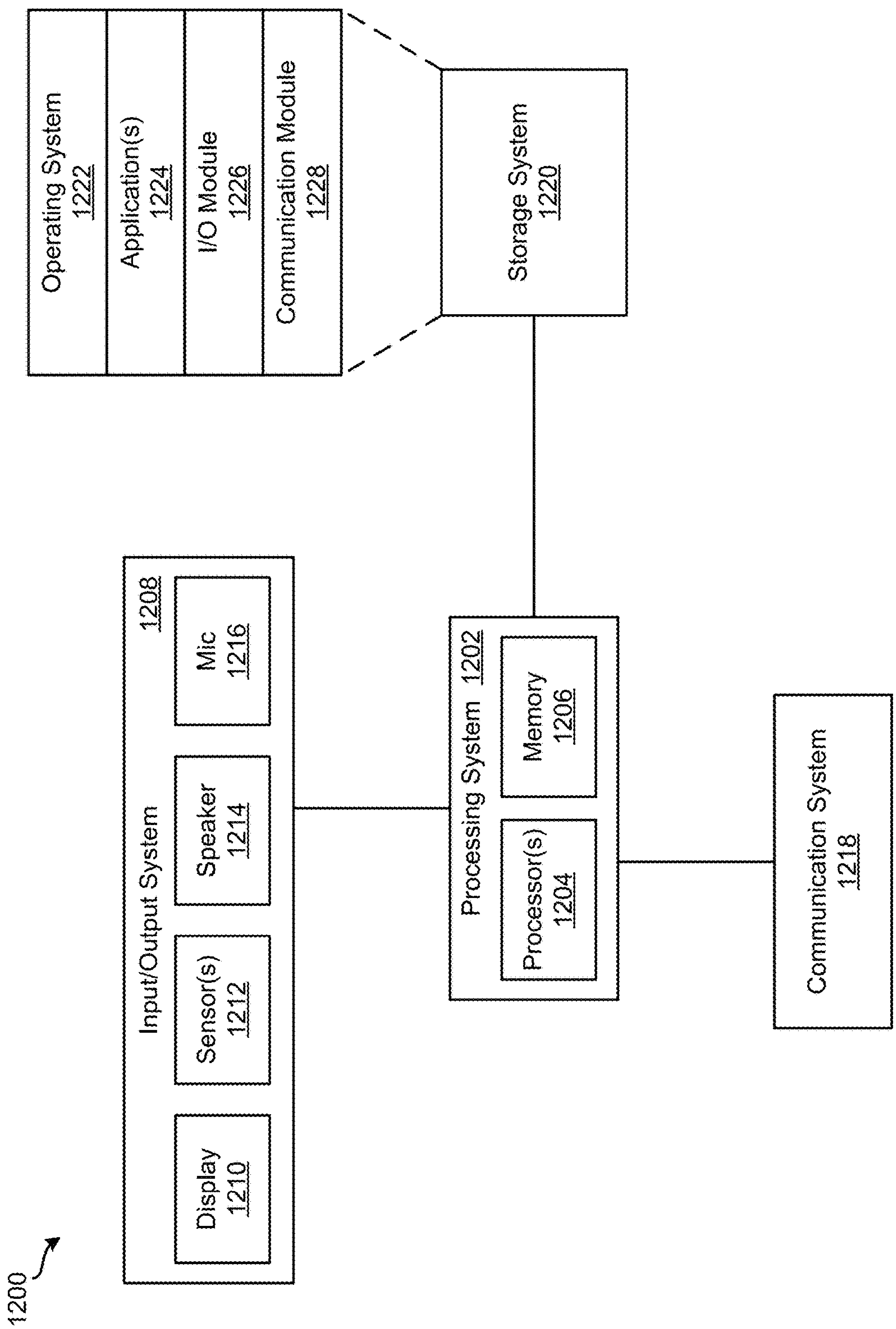
1200
Operating System 1222
Application(s) 1224
I/O Module 1226
Communication Module 1228
Storage System 1220
Input/Output System 1208
Display 1210
Sensor(s) 1212
Speaker 1214
Mic 1216
Processing System 1202
Processor(s) 1204
Memory 1206
Communication System 1218

FIG. 12

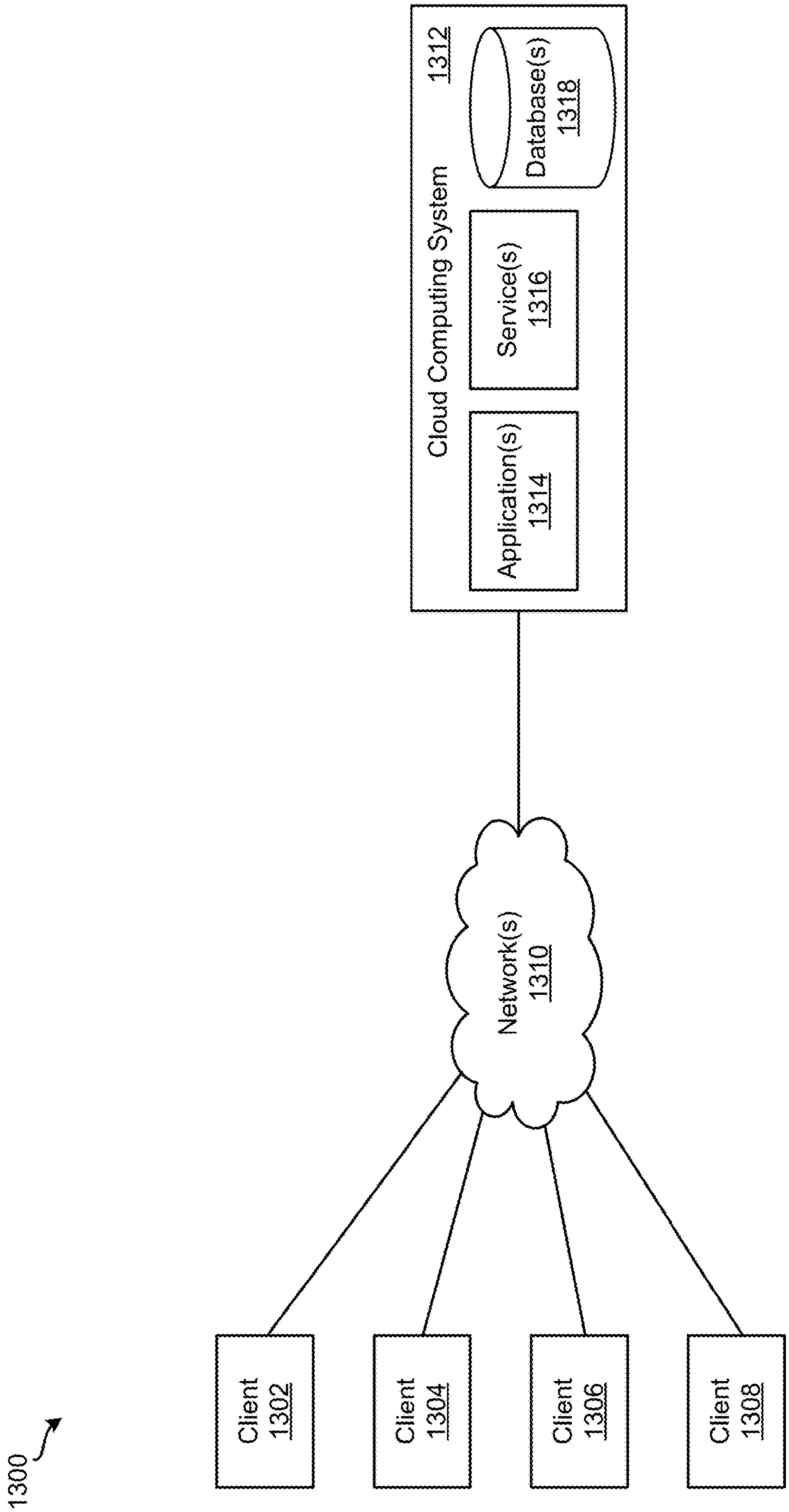
1300
Client
1302
Client
1304
Client
1306
Client
1308
Network(s)
1310
Cloud Computing System
1312
Application(s)
1314
Service(s)
1316
Database(s)
1318

FIG. 13

DATA PROCESSING SYSTEM FOR SMART DEVICES

CROSS-REFERENCE TO RELATED APPLICATION

The present application claims the benefit and priority of U.S. Provisional Application No. 62/993,545, filed Mar. 23, 2020, entitled "Smart Emergency Devices and Real-time Notifications for Emergency Devices," the entire contents of which are incorporated herein by reference in its entirety for all purposes.

BACKGROUND

Smart devices are electronic devices that can be configured to connect to other devices or networks through a variety of communication protocols (e.g., Bluetooth, NFC, Wi-Fi, 4G, etc.). Such devices may operate interactively and autonomously. Examples of smart devices include smartphones, smart cars, smart thermostats, smart doorbells, smart locks, smart refrigerators, phablets and tablets, smartwatches, smart glasses, smart bands, smart key chains, smart speakers, etc. In some cases, a smart device is an electronic device that has the following properties: (1) the device is networked, distributed and transparently accessible; (2) the device hides human-computer interactions from users; and (3) the device has context awareness of an environment.

SUMMARY

In some embodiments, a non-transitory machine-readable medium stores a program executable by at least one processing unit of a device. The program receives sensor data from a set of sensors. Each sensor in the set of sensors is configured to sense a physical quantity in an environment. Based on the sensor data, the program further determines a set of configurations for a set of smart devices. The set of smart devices includes a set of smart emergency devices installed in a building. Each smart emergency device in the set of smart emergency devices is configured to provide emergency exit information to guide exiting the building. The program also sends the set of configurations to the set of smart devices.

In some embodiments, the configuration for the smart emergency device may include instructions to provide information indicating whether an exit is safe to use. The set of sensors may include a fire sensor configured to sense the presence of fire.

In some embodiments, sending the set of configurations to the set of smart devices may include sending the set of configurations to a set of system interface devices. Each system interface device in the set of system interface devices may be configured to receive a particular configuration and configure a smart device in the set of smart devices based on the particular configuration. Determining the set of configurations for the set of smart devices may include performing a lookup on a table comprising mappings between sets of sensor data and sets of configurations for the set of smart devices; based on the lookup, identifying a particular set of sensor data that matches the received sensor data, and using a particular set of configurations in the sets of configurations to which the particular set of sensor data maps as the set of configurations for the set of smart devices.

In some embodiments, receiving the sensor data from the set of sensors may include receiving the sensor data from a system interface device configured to receive the sensor data from the set of sensors. The system interface device may be further configured to receive the sensor data from a sensor interface configured to receive the sensor data from the set of sensors.

In some embodiments, a method receives sensor data from a set of sensors. Each sensor in the set of sensors is configured to sense a physical quantity in an environment. Based on the sensor data, the method further determines a set of configurations for a set of smart devices. The set of smart devices includes a set of smart emergency devices installed in a building. Each smart emergency device in the set of smart emergency devices is configured to provide emergency exit information to guide exiting the building. The method also sends the set of configurations to the set of smart devices.

In some embodiments, the configuration for the smart emergency device may include instructions to provide information indicating whether an exit is safe to use. The set of sensors may include a fire sensor configured to sense the presence of fire.

In some embodiments, sending the set of configurations to the set of smart devices may include sending the set of configurations to a set of system interface devices. Each system interface device in the set of system interface devices may be configured to receive a particular configuration and configure a smart device in the set of smart devices based on the particular configuration. Determining the set of configurations for the set of smart devices may include performing a lookup on a table comprising mappings between sets of sensor data and sets of configurations for the set of smart devices; based on the lookup, identifying a particular set of sensor data that matches the received sensor data, and using a particular set of configurations in the sets of configurations to which the particular set of sensor data maps as the set of configurations for the set of smart devices.

In some embodiments, receiving the sensor data from the set of sensors may include receiving the sensor data from a system interface device configured to receive the sensor data from the set of sensors. The system interface device may be further configured to receive the sensor data from a sensor interface configured to receive the sensor data from the set of sensors.

In some embodiments, a system includes a set of processing units and a non-transitory machine-readable medium that stores instructions. The instructions cause at least one processing unit to receive sensor data from a set of sensors, each sensor in the set of sensors configured to sense a physical quantity in an environment. Based on the sensor data, the instructions further cause the at least one processing unit to determine a set of configurations for a set of smart devices. The set of smart devices includes a set of smart emergency devices installed in a building. Each smart emergency device in the set of smart emergency devices is configured to provide emergency exit information to guide exiting the building. The instructions also cause the at least one processing unit to send the set of configurations to the set of smart devices.

In some embodiments, the configuration for the smart emergency device may include instructions to provide information indicating whether an exit is safe to use. The set of sensors may include a fire sensor configured to sense the presence of fire.

In some embodiments, sending the set of configurations to the set of smart devices may include sending the set of configurations to a set of system interface devices. Each system interface device in the set of system interface devices may be configured to receive a particular configuration and configure a smart device in the set of smart devices based on the particular configuration. Determining the set of configurations for the set of smart devices may include performing a lookup on a table comprising mappings between sets of sensor data and sets of configurations for the set of smart devices; based on the lookup, identifying a particular set of sensor data that matches the received sensor data, and using a particular set of configurations in the sets of configurations to which the particular set of sensor data maps as the set of configurations for the set of smart devices.

In some embodiments, receiving the sensor data from the set of sensors may include receiving the sensor data from a system interface device configured to receive the sensor data from the set of sensors. The system interface device may be further configured to receive the sensor data from a sensor interface configured to receive the sensor data from the set of sensors.

The following detailed description and accompanying drawings provide a better understanding of the nature and advantages of various embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a system according to some embodiments.

FIG. **2** illustrates an example dataflow through the system illustrated in FIG. **1** according to some embodiments.

FIGS. **3**A and **3**B illustrate examples of a sensor table according to some embodiments.

FIG. **4** illustrates an example of a configuration lookup table according to some embodiments.

FIG. **5** illustrates a process for configuring smart devices according to some embodiments.

FIG. **6** illustrates another example dataflow through the system illustrated in FIG. **1** according to some embodiments.

FIGS. **7**A and **7**B illustrate examples of a sensor table according to some embodiments.

FIG. **8** illustrates an example notification according to some embodiments.

FIG. **9** illustrates an example floor plan according to some embodiments.

FIG. **10** illustrates a process for providing notifications of event occurrences according to some embodiments.

FIG. **11** illustrates an exemplary computer system, in which various embodiments may be implemented.

FIG. **12** illustrates an exemplary computing device, in which various embodiments may be implemented.

FIG. **13** illustrates an exemplary system, in which various embodiments may be implemented.

DETAILED DESCRIPTION

In the following description, for purposes of explanation, numerous examples and specific details are set forth in order to provide a thorough understanding of the present disclosure. It will be evident, however, to one skilled in the art that various embodiment of the present disclosure as defined by the claims may include some or all of the features in these examples alone or in combination with other features described below, and may further include modifications and equivalents of the features and concepts described herein.

Described herein are techniques for providing a data processing system for smart devices. For example, the data processing system may receive sensor data from several sensors (e.g., fire sensors, smoke sensors, temperature sensors, etc.) installed in a building. Based on the sensor data, the data processing system determines configurations for several smart devices installed in and/or around the building. The smart devices can be configured to display different information (e.g., whether an exit is safe to use) based on different configurations. Finally, the data processing system sends the configurations to the smart devices so the smart devices and display the proper information. In this manner, evacuation paths can be automatically calculated end to end and prevent instances where people are directed to go into unsafe areas or dead ends.

In addition, described here are techniques for providing a data processing system that detects events and provides appropriate notifications. For instance, the data processing system can receive sensor data from several sensors installed in a building. Based on the sensor data, the data processing system detects whether there is a change in the sensor data sensed by the several sensors. Based on detected changes in the sensor data, the data processing system generates a particular notification and sends the notification to subscribers associated with the building.

FIG. **1** illustrates a system **100** according to some embodiments. As shown, system **100** includes sensors **105***a-k*, sensor interface **110**, system interface device **115**, smart devices **120***a-m*, system interface devices **125***a-m*, data processing system **130**, and subscribers **175***a-n*. Subscribers **175***a-n* may be users that receive notifications from data processing system **130**. Each subscriber **175** can receive notifications in a number of different ways. For example, a subscriber **175** may receive notifications through email, text message, short message service (SMS) message, an application operating on a client device, etc.

Sensors **105***a-k* are each configured to sense a physical quantity in an environment. For example, a sensor **105** may be a fire sensor configured to sense the presence of fire, a smoke sensor configured to sense the presence of smoke, a temperature sensor configured to sense temperature, a gas sensor (e.g., a carbon monoxide sensor) configured to sense the presence of gas, a water sensor configured to sense the presence of water, etc. In some embodiments, sensors **105***a-k* are the same type of sensor. In other embodiments, sensors **105***a-k* may be different types of sensors. Still, in some embodiments, sensors **105***a-k* can be a combination of the same type of sensors and different types of sensors.

Sensors **105***a-k* may use different techniques to provide sensor data to sensor interface **110**. For example, in some embodiments, each of the sensors **105***a-k* can send sensor interface **110** sensor data at defined intervals (e.g., once a second, once every thirty seconds, once a minute, etc.). In other embodiments, each sensor **105** may receive a request for sensor data from sensor interface **110**. In response to the request, the sensor **105** sends sensor interface **110** the requested sensor data. Still, in some embodiments, sensors **105***a-k* can be configured to only send sensor data upon detection of a particular event (e.g., the presence of fire, smoke, gas, etc.). For this example, sensors **105***a-k* are installed in and/or around a building.

Sensor interface **110** is responsible for managing sensor data sensed by sensors **105***a-k*. For example, in some instances, sensor interface **110** may receive sensor data from sensors **105***a-k*. In other instances, sensor interface **110** sends sensors **105***a-k* requests for sensor data at defined intervals (e.g., once a second, once every thirty seconds, once a minute, etc.). When sensor interface **110** receives sensor data from a sensor **105**, sensor interface **110** forwards the sensor data to system interface device **115**. In some embodiments, the sensor data that sensor interface **110** sends system interface device **115** specifies, for each of the sensors

105*a-k*, a sensor identifier (ID) for uniquely identifying the sensor **105** and the sensor data sensed by the sensor **105**. Sensor interface **110** can be implemented by a sensor panel (e.g., a fire sensor panel, a smoke sensor panel, etc.).

System interface device **115** serves as an interface between sensor interface **110** and data processing system **130**. For instance, when system interface device **115** receives sensor data from sensor interface **110**, system interface device **115** forwards the sensor data to data processing system **130**. As mentioned above, the sensor data that system interface device **115** receives from sensor interface **110** specifies, for each of the sensors **105***a-k*, a sensor ID associated with the sensor **105** and the sensor data sensed by the sensor **105**. In some of those cases, system interface device **115** sends data processing system **130** the sensor data by generating, for each of the sensors **105***a-k*, a message that includes a sensor ID associated with the sensor **105** and the sensor data sensed by the sensor **105** and sending the message to data processing system **130**. System interface device **115** may be implemented as an Internet of Things (IoT) device. In some embodiments, an IoT device is a computing device that is configured to transmit data a network without human-to-human interaction or human-to-computer interaction.

Each of the smart devices **120***a-m* may be an electronic device configured to connect to other devices or networks through one or more communication protocols. In some embodiments, smart devices **120***a-m* can operate interactively and autonomously. In this example, smart devices **120***a-m* are installed in and/or around a building. As such, each of the smart devices **120***a-m* is also configured to provide (e.g., via a display screen and/or lights coupled to the smart device **120**, a speaker coupled to the smart device **120**, etc.) emergency exit information to guide exiting the building. The emergency exit information may indicate that an exit is safe to use; that the exit is unsafe to use; a direction towards a safe exit, that the smart device **120** is not functional and, thus, to ignore the smart device **120**; etc.

Different visual and/or aural indicators may be used to indicate different emergency exit information. For instance, each of the smart devices **120***a-m* may display a green lit icon (e.g., a walk icon, an arrow icon, etc.) to indicate that an exit is safe to use or indicate a direction towards a safe exit, a red lit icon (e.g., a stop icon, an "X" icon) to indicate that the exit is unsafe to use, and a black lit icon (e.g., a not functioning icon) to indicate that the smart device **120** is not functional. As another example, each of the smart devices **120***a-m* may emit a first defined sound or voice message (e.g., "exit this way") to indicate that an exit is safe to use, a second defined sound or voice message (e.g., "do not use this exit") to indicate that the exit is unsafe to use, and a third defined sound or voice message (e.g., "ignore this exit") to indicate that the smart device **120** is not functional. One of ordinary skill in the art will appreciate that additional and/or different visual or aural indicators may be used in some embodiments. When a smart device **120** receives from a system interface device **125** instructions to provide certain emergency exit information, the smart device **120** provides the respective emergency exit information (e.g., by displaying the corresponding information and/or emitting the corresponding sound).s

System interface devices **125***a-m* are each configured to manage a particular smart device **120**. As shown in FIG. **1**, system interface device **125***a* manages smart device **120***a*, system interface device **125***b* manages smart device **120***b*, system interface device **125***c* manages smart device **120***c*, and so on and so forth. Each system interface device **125** is configured to receive configurations from data processing system **130** and, based on the configuration, configure the smart device **120** that the system interface device **125** is managing. For example, a system interface device **125** can receive from data processing system **130** a configuration that includes instructions to configure a smart device **120** to provide specific emergency exit information. In response to receiving the configuration, the system interface device **125** configures the smart device to provide the specified emergency exit information.

As illustrated in FIG. **1**, data processing system **130** includes sensor message handler **135**, sensor status manager **140**, smart device message handler **145**, notification manager **150**, and storages **155**-**170**. Sensor data storage **155** stores sensor data sensed by sensors **105***a-k* (e.g., real-time sensor data, historical sensor data, etc.). Smart device data storage **160** is configured to store configurations for smart devices **120***a-m*. Subscriber data storage **165** stores a set of subscriber information associated with a building. Examples of subscriber information may include a name of a subscriber (e.g., a building facility manager, an owner of the building, an insurance company, a security company, a firefighter, etc.), contact information (e.g., a telephone number, an email address, a user identifier (ID) associated with a messaging application, etc.) associated with the subscriber, etc. Building data storage **170** is configured to store building information associated with a building. Examples of building information can include an address of a building, a contact associated with the building, contact information (e.g., a telephone number, an email address, etc.) associated with the contact, a floor plan of the building that includes locations of sensors and smart devices installed in and/or around the building, etc.

Sensor message handler **135** serves to handle messages received from system interface device **115**. For example, sensor message handler **135** can receive from system interface device **115** a message specifying a sensor ID associated with a sensor **105** and sensor data sensed by the sensor **105**. In response to receiving the message, sensor message handler **135** sends the sensor ID and the sensor data to sensor status manager **140** for processing.

Sensor status manager **140** is responsible for managing sensor data. For instance, when sensor status manager **140** receives from sensor message handler **135** a sensor ID associated with a sensor **105** and sensor data sensed by the sensor **105**, sensor status manager **140** updates the sensor data stored in sensor data storage **155** with the received sensor data. Then, sensor status manager **140** uses data stored in sensor data storage **155** and smart device data storage **160** to determine configurations for smart devices **120***a-m*. In some embodiments, sensor status manager **140** also uses data stored in data from building data storage **170** (e.g., a floor plan) to determine configurations for smart devices **120***a-m*. Sensor status manager **140** sends the configurations to smart device message handler **145**. In addition, sensor status manager **140** may check whether the sensor data of sensors **105***a-k* before the update all specify a first defined value (e.g., "no fire," "no smoke," "no gas," etc.). If so, sensor status manager **140** checks whether the update to the sensor data stored in sensor data storage **155** causes the sensor data associated with a sensor **105** to change from the first defined value to a second defined value (e.g., "fire present," "smoke present," "gas present," etc.). If sensor status manager **140** detects such a change, sensor status manager **140** sends notification manager **150** a notification indicating that an occurrence of an event is detected.

Sensor status manager **140** may also detect other events. In some embodiments where sensors **105**a-k are configured to send sensor interface **110** sensor data at defined intervals, sensor status manager **140** may determine that a sensor(s) **105**, sensor interface **110**, and/or system interface device **115** has failed when sensor status manager **140** has not received sensor data from the sensor(s) **105** at the defined intervals. Upon making such a determination, sensor status manager **140** sends notification manager **150** a message indicating the sensor(s) **105**, sensor interface **110**, and/or system interface device **115** requires servicing. Sensor status manager **140** also sends smart device message handler **145** configurations for smart devices **120**a-m to indicate that smart devices **120**a-m are not functional. In some instances where smart device message handler **145** is unable to communicate with a system interface device(s) **125**, sensor status manager **140** determines that the system interface device(s) **125** is not functional. In such instances, sensor status manager **140** sends notification manager **150** a message indicating the system interface devices(s) requires servicing.

Smart device message handler **145** handles messages for smart devices **120**a-m. For example, smart device message handler **145** may receive from sensor status manager **140** configurations for smart devices **120**a-m. In response, smart device message handler **145** generates a message for each smart device **120** that includes the respective configuration for the smart device **120** and sends the message to the system interface device **125** that is responsible for managing the smart device **120**. In some embodiments smart device message handler **145** continues to send current configurations to system interface devices **125**a-m at defined intervals (e.g., once every two seconds, once every fifteen seconds, once a minute, etc.). In other embodiments, smart device message handler **145** sends a system interface device(s) **125** configurations for a corresponding smart device(s) **120** when the state of the smart device(s) **120** changes from its current state.

Notification manager **150** is configured to manage notifications for subscribers **175**a-n. For instance, upon receiving from sensor status manager **140** a notification indicating that an occurrence of an event is detected, notification manager **150** accesses building data storage **170** to retrieve building information associated with building in and/or around which sensors **105**a-k and smart devices **120**a-m are installed. Next, notification manager **150** accesses subscriber data storage **165** to retrieve the set of subscriber information associated with the building. Notification manager **150** then generates a notification that includes a reference to the building information (e.g., a unified resource locator (URL) to a webpage providing the building information) for each subscriber in the set of subscribers. Finally, notification manager **150** sends the notifications to the respective subscribers **175**a-n. In some embodiments, notification manager **150** uses the subscriber information associated with each subscriber **175** to determine the manner in which to send the notification (e.g., email, text message, SMS message, an application operating on a client device, etc.). As another example, notification manager **150** can receive from sensor status manager **140** a message indicating **150** a message indicating a sensor(s) **105**, sensor interface **110**, system interface device **115** requires servicing, and/or a system interface devices(s) **120** requires servicing. In response to such a message, notification manager **150** sends the notifications to the respective subscribers **175**a-n.

FIG. **1** shows a particular configuration of system **100**. One of ordinary skill in the art will realize that different configurations of system **100** are possible. For example, in some embodiments, system **100** does not include sensor interface **110**. Instead, system interface **115** manages sensor data sensed by sensors **105**a-k in the manner described above. In some such embodiments, system **100** can have multiple system interface devices similarly configured to system interface device **115** to manage the sensor data. In some of these embodiments, each system interface device is configured to manage sensor data for one or more sensors **105**a-k. In some embodiments, system **100** can have multiple sensor interfaces similarly configured to sensor interface **110** to manage the sensor data sensed by sensors **105**a-k. In some of these embodiments, each sensor interface is configured to manage sensor data for one or more sensors **105**a-k. As another example, system **100** may have fewer system interface devices **125** where at least one system interface device **125** is responsible for configuring more than one smart devices **120**a-m. In some instances, a single system interface device **125** may be used to configure smart devices **120**a-m. In some embodiments, each system interface device **125** can be embedded in the corresponding smart device **120**. In some cases, one or more smart devices **120**a-m may include one or more sensors **105**a-k. While FIG. **1** shows notification manager **150**, subscriber data storage **165**, and building data storage **170** as being part of data processing system **130**, these components may be implemented by a separate computing system in some embodiments.

FIG. **2** illustrates an example dataflow through system **100** according to some embodiments. Specifically, the dataflow shows how smart devices **120**a-m are configured based on sensor data sensed by sensors **105**a-k. For this example, sensors **105**a-k are fire sensors. The dataflow starts by sensors **105**a-k sending, at **205-215**, sensor data (e.g., no fire is sensed or fire is sensed) to sensor interface **110**. Upon receiving the sensor data from sensors **105**a-k, sensor interface **110**, sends, at **220**, the sensor data to system interface device **115**. The sensor data that sensor interface **110** sends system interface device **115** specifies, for each of the sensors **105**a-k, a sensor ID associated with the sensor **105** and the sensor data sensed by the sensor **105**. Once system interface device **115** receives the sensor data from sensor interface **110**, system interface device **115** generates, for each of the sensors **105**a-k, a message that includes the sensor ID associated with the sensor **105** and the sensor data sensed by the sensor **105** and sending, at **225**, the message to data processing system **130**.

When sensor message handler **135** receives from system interface device **115** a message specifying a sensor ID associated with a sensor **105** and sensor data sensed by the sensor **105**, sensor message handler **135** sends, at **230**, the sensor ID and the sensor data to sensor status manager **140**. Upon receiving the data, sensor status manager **140** updates the sensor data stored in sensor data storage **155** with the received sensor data.

FIGS. **3**A and **3**B illustrate examples of a sensor table **300** according to some embodiments. In particular, FIG. **3**A illustrates sensor table **300** before sensor status manager **140** updates the sensor data stored in sensor data storage **155**. Sensor table **300** is stored in sensor data storage **155**. For this example, system **100** has three sensors with a first sensor with a sensor ID of "Sensor 1," a second sensor with a sensor ID of "Sensor 2," and a third sensor with a sensor ID of "Sensor 3." Thus, sensor table includes three columns. As shown, the first column is configured to store sensor data for the first sensor, the second column is configured to store sensor data for the second sensor, and the third column is configured to store sensor data for the third sensor. So before sensor status manager **140** updates the sensor data, the first sensor previously sensed fire, the second sensor previously did not sense fire, and the third sensor previously did not sense fire.

In this example dataflow, the data that sensor message handler **135** sends to sensor status manager **140** specifies a sensor ID of "Sensor 3" and sensor data specifying "Fire" indicating that fire was sensed by the third sensor. FIG. **3**B illustrates sensor table **300** after sensor status manager **140** updates the sensor data stored in sensor data storage **155** with the received sensor data. As shown, sensor table **300** in FIG. **3**B shows the third column for storing sensor data for the third sensor updated with the sensor data received from sensor message handler **135**.

Returning to FIG. **2**, after sensor status manager **140** updates the sensor data stored in sensor data storage **155** with the received sensor data, sensor status manager **140** uses data stored in sensor data storage **155** and smart device data storage **160** to determine configurations for smart devices **120***a-m*. In some embodiments, a configuration lookup table is used to determine configurations for smart devices **120***a-m*.

FIG. **4** illustrates an example of a configuration lookup table **400** according to some embodiments. Configuration lookup table **400** is stored in smart device data storage **160**. As shown, configuration lookup table **400** includes six columns. The left three columns are configured to store different permutations of sensor data sensed by the three sensors for this example. Three smart devices are used in this example. As shown, the right three columns are configured to store configurations for the three smart devices (i.e., smart device 1 (SD**1**), smart device 2 (SD**2**), and smart device 3 (SD **3**)). Each row in configuration lookup table **400** specifies a set of sensor values for the three sensors and a corresponding configuration for each of the three smart devices. That is, each row provides a mapping between a set of sensor values for the three sensors and configurations for the three smart devices. In this example, sensor status manager **140** determine configurations for smart devices 1-3 by accessing sensor table **300** stored in sensor data storage **155** to retrieve the current sensor values sensed by the three sensors and then performing a lookup on configuration lookup table **400** to identify a row that has sensor values that match the sensor values retrieved from sensor table **300**. As shown in FIG. **3**B, the sensor values for three sensors is "Fire" for Sensor 1, "No fire" for Sensor 2, and "Fire" for Sensor 3. The row in configuration lookup table **400** that matches these sensor values is row **405**. As such, row **405** specifies the configuration for smart device 1 as "Red," the configuration for smart device 2 as "Green," and the configuration for smart device 3 as "Red." The same configuration for smart devices 1-3 can be used for different combinations of sensor values for sensors 1-3. For example, the same configuration for smart devices 1-3 is used in this example for when sensors 1-3 have the sensor values "Fire," "Fire," and "No fire," as shown in the fifth row of table **400**, and when sensors 1-3 have the sensor values "Fire," "Fire," and "Fire," as shown in the last row of table **400**.

Returning to FIG. **2**, sensor status manager **140** sends, at **235**, the configurations to smart device message handler **145**. Once smart device message handler **145** receives configurations for smart devices **120***a-m* from sensor status manager **140**, smart device message handler **145** generates a message for each smart device **120** that includes the respective configuration for the smart device **120** and sends the message to the system interface device **125** that is responsible for managing the smart device **120**. In this example, smart device **120***a* is smart device 1, smart device **120***b* is smart device 2, and smart device **120***m* is smart device 3. Hence, smart device message handler **145** generates a message for smart device **120***a* that includes a "Red" configuration and sends, at **240**, the message to system interface device **125***a*, which system interface device **125***a* forwards, at **255**, to smart device **120***a*. Smart device message handler **145** also generates a message for smart device **120***b* that includes a "Green" configuration and sends, at **245**, the message to system interface device **125***b*, which system interface device **125***b* forwards, at **260**, to smart device **120***b*. Lastly, smart device message handler **145** generates a message for smart device **120***m* that includes a "Red" configuration and sends, at **250**, the message to system interface device **125***m*, which system interface device **125***m* forwards, at **265**, to smart device **120***m*.

For this example, a "Red" configuration includes instructions for configuring a smart device to provide a red lit icon to indicate that an exit is unsafe to use and a "Green" configuration includes instructions for configuring a smart device to provide green lit icon to indicate that an exit is safe to use or indicate a direction towards a safe exit. Therefore, when system interface device **125***a* receives the message from smart device message handler **145**, system interface device **125***a* configures smart device **120***a* to provide a red lit icon to indicate that an exit is unsafe to use. Similarly, when system interface device **125***m* receives the message from smart device message handler **145**, system interface device **125***m* configures smart device **120***m* to provide a red lit icon to indicate that an exit is unsafe to use. Finally, when system interface device **125***b* receives the message from smart device message handler **145**, system interface device **125***b* configures smart device **120***b* to provide a green lit icon to indicate that an exit is safe to use.

FIG. **5** illustrates a process **500** for configuring smart devices according to some embodiments. In some embodiments, data processing system **130** performs process **500**. Process **500** begins by receiving, at **510**, sensor data from a set of sensors. Each sensor in the set of sensors is configured to sense a physical quantity in an environment. Referring to FIG. **2** as an example, sensor message handler **135** may receive the sensor data from sensors **105***a-k* via sensor interface **110** and system interface device **115**.

Next, based on the sensor data, process **500** determines, at **520**, a set of configurations for a set of smart devices. Referring to FIG. **2** as an example, sensor status manager **140** can access sensor data stored in sensor data storage **155** (e.g. sensor table **200** shown in FIG. **3**B) and configuration data stored in smart device data storage **160** (e.g., configuration lookup table **400**) to determine configurations for smart devices **120***a-m*.

Finally, process **500** sends, at **530**, the set of configurations to the set of smart devices. Referring to FIG. **2** as an example, smart device message handler **145** may receive configurations for smart devices **120***a-m* from sensor status manager **140**. In response, smart device message handler **145** generates a message for each smart device **120** that includes the respective configuration for the smart device **120** and sends the message to the system interface device **125** that is responsible for managing the smart device **120**.

FIG. **6** illustrates another example dataflow through the system illustrated in FIG. **1** according to some embodiments. In particular, this example dataflow shows how notification are generated for subscribers **175***a-n*. In this example, sensors **105***a-k* are fire sensors. The three sensors and smart devices used in the dataflow shown in FIG. **2** are also used for this example. The dataflow starts by sensors **105***a-k* sending, at **605-615**, sensor data (e.g., no fire is sensed or fire is sensed) to sensor interface **110**. In response to receiving the sensor data, sensor interface **110**, sends, at **620**, the sensor data to system interface device **115**. The sensor data that sensor interface **110** sends system interface device **115** specifies, for each of the sensors **105***a-k*, a sensor ID associated with the sensor **105** and the sensor data sensed by the sensor **105**. After receiving the sensor data from sensor interface **110**, system interface device **115** generates, for each of the sensors **105***a-k*, a message that includes the sensor ID associated with the sensor **105** and the sensor data sensed by the sensor **105** and sending, at **625**, the message to data processing system **130**.

Upon receiving a message specifying a sensor ID associated with a sensor **105** and sensor data sensed by the sensor **105**, sensor message handler **135** sends, at **630**, the sensor ID and the sensor data to sensor status manager **140**. In response to receiving the data, sensor status manager **140** checks whether the sensor data of sensors **105***a-k* before the update all specify a first defined value. If so, sensor status manager **140** checks whether the update to the sensor data stored in sensor data storage **155** causes the sensor data associated with a sensor **105** to change from the first defined value to a second defined value. For this example, the first defined value is "No fire" and the second defined value is "Fire."

FIGS. **7**A and **7**B illustrate examples of a sensor table **700** according to some embodiments. Specifically, FIG. **7**A illustrates sensor table **700** before sensor status manager **140** updates the sensor data stored in sensor data storage **155**. Sensor table **700** is stored in sensor data storage **155**. As shown, sensor table **700** is similar to sensor tale **300** except the sensor values for the three sensor is "No fire," the first defined value.

In this example dataflow, the data that sensor message handler **135** sends to sensor status manager **140** specifies a sensor ID of "Sensor 2" and sensor data specifying "Fire" indicating that fire was sensed by the second sensor. FIG. **7**B illustrates sensor table **700** after sensor status manager **140** updates the sensor data stored in sensor data storage **155** with the received sensor data. As shown, sensor table **700** in FIG. **7**B shows the second column for storing sensor data for the second sensor updated with the sensor data received from sensor message handler **135**.

For this example, when sensor status manager **140** detects the sensor value for a sensor **105** change from the first defined value to the second defined value based on the update, sensor status manager **140** sends, at **635**, notification manager **150** a notification indicating that an occurrence of a fire event is detected. Upon receiving the notification from sensor status manager **140**, notification manager **150** accesses building data storage **170** to retrieve building information associated with building in and/or around which the three sensors and the three smart devices are installed. Notification manager **150** then accesses subscriber data storage **165** to retrieve the set of subscriber information associated with the building. Next, notification manager **150** generates a notification that includes a reference to the building information (e.g., a URL to a webpage providing the building information) for each subscriber in the set of subscribers.

FIG. **8** illustrates an example notification **800** according to some embodiments. In particular, notification manager **150** generates notification **800** for this example. As shown, notification **800** is an email destined for a subscriber named John Smith. Notification **800** that includes an address of the building where occurrence of the fire event was detected. Also, notification **800** includes a reference **805** to a floor plan of the building (e.g., a URL to a webpage providing the floor plan of the building).

FIG. **9** illustrates an example floor plan **900** according to some embodiments. Specifically, floor plan **900** is the floor plan to which reference **805** points in this example. In some embodiments, data processing system **130** provides floor plan **900** to an application operating on a client device of the subscriber "John Smith". In other embodiments, data processing system **130** provides floor plan **900** to a web browser operating on the client device of the subscriber "John Smith". In some instances, the subscriber is authenticated to ensure that the subscriber has rights to access data associated with floor plan **900**. As shown, floor plan **900** includes the address of the building as well as contact information for a contact associated with the building. Additionally, floor plan **900** shows the locations of three fire sensors **905-915** and seven smart devices **920-950**. Floor plan also provides real-time statuses of the sensors **905-915** and smart devices **920-950**. In this example, a gray fire sensor indicates that the fire sensor is sensing the presence of fire and a white fire sensor indicates that the fire sensor is not sensing the presence of fire. Here, sensor **905** is sensing the presence of fire while sensors **910** and **915** are not sensing the presence of fire. For this example, a gray smart device indicates that the smart device is providing emergency exit information indicating that an exit is unsafe to use while a white smart device indicates that the smart device is providing emergency exit information indicating that an exit is safe to use or indicating a direction towards a safe exit. Here, smart devices **930** and **935** are providing emergency exit information indicating that the respective exits are unsafe. Smart devices **920**, **925**, **945** and **950** are providing emergency exit information indicating that the respective exits are safe to use and smart device **940** is providing emergency exit information indicating the direction towards the top right exit is safe. When data processing system **130** receives sensor values for sensors **905-915** and/or smart devices **920-950**, data processing system **130** updates floor plan **900** with the updated sensor values for sensors **905-915** and smart devices **920-950**. The client device of each subscriber **175** that is providing floor plan **900** may, at define intervals (e.g., once every three seconds, once every ten seconds, once a minute, etc.), query data processing system **130** for status updates for sensors **905-915** and smart devices **920-950**. Once the client device receives status updates, the client device updates the corresponding sensors **905-915** and smart devices **920-950** in floor plan **900**.

FIG. **10** illustrates a process **1000** for providing notifications of event occurrences according to some embodiments. In some embodiments, data processing system **130** performs process **1000**. Process **1000** begins by receiving, at **1010**, a set of sensor data from a set of sensors. Each sensor in the set of sensors is configured to sense a physical quantity. Referring to FIG. **6** as an example, sensor message handler **135** may receive the sensor data from sensors **105***a-k* via sensor interface **110** and system interface device **115**.

Next, based on the set of sensor data, process **1000** determines, at **1020**, that a particular event has occurred. Referring to FIG. **6** as an example, sensor status manager **140** checks whether the previous sensor data of sensors **105***a-k* before update the sensor data all specify a first defined value. If so, sensor status manager **140** checks whether the update to the sensor data stored in sensor data storage **155** causes the sensor data associated with a sensor **105** to change from the first defined value to a second defined value. When sensor status manager **140** detects the sensor value for a sensor **105** change from the first defined value to the second defined value based on the update, sensor status manager **140** sends, at **635**, notification manager **150** a notification indicating that an occurrence of an event is detected.

Finally, based on the determination that the particular event has occurred, process **1000** sends, at **1030**, a set of notifications to a set of subscribers. Referring to FIG. **6** as an example, notification manager **150** accesses building data storage **170** to retrieve building information associated with building in and/or around which the three sensors and the three smart devices are installed. Next, notification manager **150** accesses subscriber data storage **165** to retrieve the set of subscriber information associated with the building. Then, notification manager **150** generates a notification that includes a reference to the building information (e.g., a URL to a webpage providing the building information) for each subscriber in the set of subscribers.

FIGS. **1-10** describes examples and embodiments of a data processing system that handles sensors and smart devices installed for one building. One of ordinary skill in the art will understand that the data processing system may support sensors and smart devices installed for several buildings using the same and/or similar techniques described herein. Furthermore, in some embodiments, data processing system **130** may be implemented as a cloud computing system. In other embodiments, data processing system **130** can be implemented as a local, on-premise system. Still, in some embodiments, multiple of the same or different data processing systems (e.g., data processing system **130**) may be deployed. For example, a first data processing system implemented as a cloud computing system may be deployed as a primary system and a second data processing system implemented as a local, on-premise data processing system may be deployed as a backup system. As another example, multiple data processing systems may be deployed as a distributed data processing system.

FIG. **11** illustrates an exemplary computer system **1100** for implementing various embodiments described above. For example, computer system **1100** may be used to implement data processing system **130**. Computer system **1100** may be a desktop computer, a laptop, a server computer, or any other type of computer system or combination thereof. Some or all elements of sensor message handler **135**, sensor status manager **140**, smart device message handler **145**, notification manager **150**, or combinations thereof can be included or implemented in computer system **1100**. In addition, computer system **1100** can implement many of the operations, methods, and/or processes described above (e.g., process **500** and process **1000**). As shown in FIG. **11**, computer system **1100** includes processing subsystem **1102**, which communicates, via bus subsystem **1126**, with input/output (I/O) subsystem **1108**, storage subsystem **1110** and communication subsystem **1124**.

Bus subsystem **1126** is configured to facilitate communication among the various components and subsystems of computer system **1100**. While bus subsystem **1126** is illustrated in FIG. **11** as a single bus, one of ordinary skill in the art will understand that bus subsystem **1126** may be implemented as multiple buses. Bus subsystem **1126** may be any of several types of bus structures (e.g., a memory bus or memory controller, a peripheral bus, a local bus, etc.) using any of a variety of bus architectures. Examples of bus architectures may include an Industry Standard Architecture (ISA) bus, a Micro Channel Architecture (MCA) bus, an Enhanced ISA (EISA) bus, a Video Electronics Standards Association (VESA) local bus, a Peripheral Component Interconnect (PCI) bus, a Universal Serial Bus (USB), etc.

Processing subsystem **1102**, which can be implemented as one or more integrated circuits (e.g., a conventional microprocessor or microcontroller), controls the operation of computer system **1100**. Processing subsystem **1102** may include one or more processors **1104**. Each processor **1104** may include one processing unit **1106** (e.g., a single core processor such as processor **1104-1**) or several processing units **1106** (e.g., a multicore processor such as processor **1104-2**). In some embodiments, processors **1104** of processing subsystem **1102** may be implemented as independent processors while, in other embodiments, processors **1104** of processing subsystem **1102** may be implemented as multiple processors integrate into a single chip or multiple chips. Still, in some embodiments, processors **1104** of processing subsystem **1102** may be implemented as a combination of independent processors and multiple processors integrated into a single chip or multiple chips.

In some embodiments, processing subsystem **1102** can execute a variety of programs or processes in response to program code and can maintain multiple concurrently executing programs or processes. At any given time, some or all of the program code to be executed can reside in processing subsystem **1102** and/or in storage subsystem **1110**. Through suitable programming, processing subsystem **1102** can provide various functionalities, such as the functionalities described above by reference to process **500**, process **1000**, etc.

I/O subsystem **1108** may include any number of user interface input devices and/or user interface output devices. User interface input devices may include a keyboard, pointing devices (e.g., a mouse, a trackball, etc.), a touchpad, a touch screen incorporated into a display, a scroll wheel, a click wheel, a dial, a button, a switch, a keypad, audio input devices with voice recognition systems, microphones, image/video capture devices (e.g., webcams, image scanners, barcode readers, etc.), motion sensing devices, gesture recognition devices, eye gesture (e.g., blinking) recognition devices, biometric input devices, and/or any other types of input devices.

User interface output devices may include visual output devices (e.g., a display subsystem, indicator lights, etc.), audio output devices (e.g., speakers, headphones, etc.), etc. Examples of a display subsystem may include a cathode ray tube (CRT), a flat-panel device (e.g., a liquid crystal display (LCD), a plasma display, etc.), a projection device, a touch screen, and/or any other types of devices and mechanisms for outputting information from computer system **1100** to a user or another device (e.g., a printer).

As illustrated in FIG. **11**, storage subsystem **1110** includes system memory **1112**, computer-readable storage medium **1120**, and computer-readable storage medium reader **1122**. System memory **1112** may be configured to store software in the form of program instructions that are loadable and executable by processing subsystem **1102** as well as data generated during the execution of program instructions. In some embodiments, system memory **1112** may include volatile memory (e.g., random access memory (RAM)) and/or non-volatile memory (e.g., read-only memory (ROM), programmable read-only memory (PROM), erasable programmable read-only memory (EPROM), electrically erasable programmable read-only memory (EEPROM), flash memory, etc.). System memory **1112** may include different types of memory, such as static random access memory (SRAM) and/or dynamic random access memory (DRAM). System memory **1112** may include a basic input/output system (BIOS), in some embodiments, that is configured to store basic routines to facilitate transferring information between elements within computer system **1100** (e.g., during start-up). Such a BIOS may be stored in ROM (e.g., a ROM chip), flash memory, or any other type of memory that may be configured to store the BIOS.

As shown in FIG. **11**, system memory **1112** includes application programs **1114**, program data **1116**, and operating system (OS) **1118**. OS **1118** may be one of various versions of Microsoft Windows, Apple Mac OS, Apple OS X, Apple macOS, and/or Linux operating systems, a variety of commercially-available UNIX or UNIX-like operating systems (including without limitation the variety of GNU/Linux operating systems, the Google Chrome® OS, and the like) and/or mobile operating systems such as Apple iOS, Windows Phone, Windows Mobile, Android, BlackBerry OS, Blackberry **10**, and Palm OS, WebOS operating systems.

Computer-readable storage medium **1120** may be a non-transitory computer-readable medium configured to store software (e.g., programs, code modules, data constructs, instructions, etc.). Many of the components (e.g., sensor message handler **135**, sensor status manager **140**, smart device message handler **145**, and notification manager **150**) and/or processes (e.g., process **500** and process **1000**) described above may be implemented as software that when executed by a processor or processing unit (e.g., a processor or processing unit of processing subsystem **1102**) performs the operations of such components and/or processes. Storage subsystem **1110** may also store data used for, or generated during, the execution of the software.

Storage subsystem **1110** may also include computer-readable storage medium reader **1122** that is configured to communicate with computer-readable storage medium **1120**. Together and, optionally, in combination with system memory **1112**, computer-readable storage medium **1120** may comprehensively represent remote, local, fixed, and/or removable storage devices plus storage media for temporarily and/or more permanently containing, storing, transmitting, and retrieving computer-readable information.

Computer-readable storage medium **1120** may be any appropriate media known or used in the art, including storage media such as volatile, non-volatile, removable, non-removable media implemented in any method or technology for storage and/or transmission of information. Examples of such storage media includes RAM, ROM, EEPROM, flash memory or other memory technology, compact disc read-only memory (CD-ROM), digital versatile disk (DVD), Blu-ray Disc (BD), magnetic cassettes, magnetic tape, magnetic disk storage (e.g., hard disk drives), Zip drives, solid-state drives (SSD), flash memory card (e.g., secure digital (SD) cards, CompactFlash cards, etc.), USB flash drives, or any other type of computer-readable storage media or device.

Communication subsystem **1124** serves as an interface for receiving data from, and transmitting data to, other devices, computer systems, and networks. For example, communication subsystem **1124** may allow computer system **1100** to connect to one or more devices via a network (e.g., a personal area network (PAN), a local area network (LAN), a storage area network (SAN), a campus area network (CAN), a metropolitan area network (MAN), a wide area network (WAN), a global area network (GAN), an intranet, the Internet, a network of any number of different types of networks, etc.). Communication subsystem **1124** can include any number of different communication components. Examples of such components may include radio frequency (RF) transceiver components for accessing wireless voice and/or data networks (e.g., using cellular technologies such as 2G, 3G, 4G, 5G, etc., wireless data technologies such as Wi-Fi, Bluetooth, ZigBee, etc., or any combination thereof), global positioning system (GPS) receiver components, and/or other components. In some embodiments, communication subsystem **1124** may provide components configured for wired communication (e.g., Ethernet) in addition to or instead of components configured for wireless communication.

One of ordinary skill in the art will realize that the architecture shown in FIG. **11** is only an example architecture of computer system **1100**, and that computer system **1100** may have additional or fewer components than shown, or a different configuration of components. The various components shown in FIG. **11** may be implemented in hardware, software, firmware or any combination thereof, including one or more signal processing and/or application specific integrated circuits.

FIG. **12** illustrates an exemplary computing device **1200** for implementing various embodiments described above. For example, computing device **1200** may be used to implement system interface device **115**, smart devices **120***a-m*, and system interface devices **125***a-m*. Computing device **1200** may be a cellphone, a smartphone, a wearable device, an activity tracker or manager, a tablet, a personal digital assistant (PDA), a media player, or any other type of mobile computing device or combination thereof. As shown in FIG. **12**, computing device **1200** includes processing system **1202**, input/output (I/O) system **1208**, communication system **1218**, and storage system **1220**. These components may be coupled by one or more communication buses or signal lines.

Processing system **1202**, which can be implemented as one or more integrated circuits (e.g., a conventional microprocessor or microcontroller), controls the operation of computing device **1200**. As shown, processing system **1202** includes one or more processors **1204** and memory **1206**. Processors **1204** are configured to run or execute various software and/or sets of instructions stored in memory **1206** to perform various functions for computing device **1200** and to process data.

Each processor of processors **1204** may include one processing unit (e.g., a single core processor) or several processing units (e.g., a multicore processor). In some embodiments, processors **1204** of processing system **1202** may be implemented as independent processors while, in other embodiments, processors **1204** of processing system **1202** may be implemented as multiple processors integrate into a single chip. Still, in some embodiments, processors **1204** of processing system **1202** may be implemented as a combination of independent processors and multiple processors integrated into a single chip.

Memory **1206** may be configured to receive and store software (e.g., operating system **1222**, applications **1224**, I/O module **1226**, communication module **1228**, etc. from storage system **1220**) in the form of program instructions that are loadable and executable by processors **1204** as well as data generated during the execution of program instructions. In some embodiments, memory **1206** may include volatile memory (e.g., random access memory (RAM)), non-volatile memory (e.g., read-only memory (ROM), programmable read-only memory (PROM), erasable programmable read-only memory (EPROM), electrically erasable programmable read-only memory (EEPROM), flash memory, etc.), or a combination thereof.

I/O system **1208** is responsible for receiving input through various components and providing output through various components. As shown for this example, I/O system **1208** includes display **1210**, one or more sensors **1212**, speaker **1214**, and microphone **1216**. Display **1210** is configured to output visual information (e.g., a graphical user interface (GUI) generated and/or rendered by processors **1204**). In some embodiments, display **1210** is a touch screen that is configured to also receive touch-based input. Display **1210** may be implemented using liquid crystal display (LCD) technology, light-emitting diode (LED) technology, organic LED (OLED) technology, organic electro luminescence (OEL) technology, or any other type of display technologies. Sensors **1212** may include any number of different types of sensors for measuring a physical quantity (e.g., temperature, force, pressure, acceleration, orientation, light, radiation, etc.). Speaker **1214** is configured to output audio information and microphone **1216** is configured to receive audio input. One of ordinary skill in the art will appreciate that I/O system **1208** may include any number of additional, fewer, and/or different components. For instance, I/O system **1208** may include a keypad or keyboard for receiving input, a port for transmitting data, receiving data and/or power, and/or communicating with another device or component, an image capture component for capturing photos and/or videos, etc.

Communication system **1218** serves as an interface for receiving data from, and transmitting data to, other devices, computer systems, and networks. For example, communication system **1218** may allow computing device **1200** to connect to one or more devices via a network (e.g., a personal area network (PAN), a local area network (LAN), a storage area network (SAN), a campus area network (CAN), a metropolitan area network (MAN), a wide area network (WAN), a global area network (GAN), an intranet, the Internet, a network of any number of different types of networks, etc.). Communication system **1218** can include any number of different communication components. Examples of such components may include radio frequency (RF) transceiver components for accessing wireless voice and/or data networks (e.g., using cellular technologies such as 2G, 3G, 4G, 5G, etc., wireless data technologies such as Wi-Fi, Bluetooth, ZigBee, etc., or any combination thereof), global positioning system (GPS) receiver components, and/or other components. In some embodiments, communication system **1218** may provide components configured for wired communication (e.g., Ethernet) in addition to or instead of components configured for wireless communication.

Storage system **1220** handles the storage and management of data for computing device **1200**. Storage system **1220** may be implemented by one or more non-transitory machine-readable mediums that are configured to store software (e.g., programs, code modules, data constructs, instructions, etc.) and store data used for, or generated during, the execution of the software.

In this example, storage system **1220** includes operating system **1222**, one or more applications **1224**, I/O module **1226**, and communication module **1228**. Operating system **1222** includes various procedures, sets of instructions, software components and/or drivers for controlling and managing general system tasks (e.g., memory management, storage device control, power management, etc.) and facilitates communication between various hardware and software components. Operating system **1222** may be one of various versions of Microsoft Windows, Apple Mac OS, Apple OS X, Apple macOS, and/or Linux operating systems, a variety of commercially-available UNIX or UNIX-like operating systems (including without limitation the variety of GNU/Linux operating systems, the Google Chrome® OS, and the like) and/or mobile operating systems such as Apple iOS, Windows Phone, Windows Mobile, Android, BlackBerry OS, Blackberry **10**, and Palm OS, WebOS operating systems.

Applications **1224** can include any number of different applications installed on computing device **1200**. Examples of such applications may include a browser application, an address book application, a contact list application, an email application, an instant messaging application, a word processing application, JAVA-enabled applications, an encryption application, a digital rights management application, a voice recognition application, location determination application, a mapping application, a music player application, etc.

I/O module **1226** manages information received via input components (e.g., display **1210**, sensors **1212**, and microphone **1216**) and information to be outputted via output components (e.g., display **1210** and speaker **1214**). Communication module **1228** facilitates communication with other devices via communication system **1218** and includes various software components for handling data received from communication system **1218**.

One of ordinary skill in the art will realize that the architecture shown in FIG. **12** is only an example architecture of computing device **1200**, and that computing device **1200** may have additional or fewer components than shown, or a different configuration of components. The various components shown in FIG. **12** may be implemented in hardware, software, firmware or any combination thereof, including one or more signal processing and/or application specific integrated circuits.

FIG. **13** illustrates an exemplary system **1300** for implementing various embodiments described above. For example, cloud computing system **1312** may be used to implement data processing system **130** and client devices **1302-1308** may be used to implement system interface device **115**, smart devices **120***a-m*, and system interface devices **125***a-m*. As shown, system **1300** includes client devices **1302-1308**, one or more networks **1310**, and cloud computing system **1312**. Cloud computing system **1312** is configured to provide resources and data to client devices **1302-1308** via networks **1310**. In some embodiments, cloud computing system **1300** provides resources to any number of different users (e.g., customers, tenants, organizations, etc.). Cloud computing system **1312** may be implemented by one or more computer systems (e.g., servers), virtual machines operating on a computer system, or a combination thereof.

As shown, cloud computing system **1312** includes one or more applications **1314**, one or more services **1316**, and one or more databases **1318**. Cloud computing system **1300** may provide applications **1314**, services **1316**, and databases **1318** to any number of different customers in a self-service, subscription-based, elastically scalable, reliable, highly available, and secure manner.

In some embodiments, cloud computing system **1300** may be adapted to automatically provision, manage, and track a customer's subscriptions to services offered by cloud computing system **1300**. Cloud computing system **1300** may provide cloud services via different deployment models. For example, cloud services may be provided under a public cloud model in which cloud computing system **1300** is owned by an organization selling cloud services and the cloud services are made available to the general public or different industry enterprises. As another example, cloud services may be provided under a private cloud model in which cloud computing system **1300** is operated solely for a single organization and may provide cloud services for one or more entities within the organization. The cloud services may also be provided under a community cloud model in which cloud computing system **1300** and the cloud services provided by cloud computing system **1300** are shared by several organizations in a related community. The cloud services may also be provided under a hybrid cloud model, which is a combination of two or more of the aforementioned different models.

In some instances, any one of applications **1314**, services **1316**, and databases **1318** made available to client devices **1302-1308** via networks **1310** from cloud computing system **1300** is referred to as a "cloud service." Typically, servers and systems that make up cloud computing system **1300** are different from the on-premises servers and systems of a customer. For example, cloud computing system **1300** may host an application and a user of one of client devices **1302-1308** may order and use the application via networks **1310**.

Applications **1314** may include software applications that are configured to execute on cloud computing system **1312** (e.g., a computer system or a virtual machine operating on a computer system) and be accessed, controlled, managed, etc. via client devices **1302-1308**. In some embodiments, applications **1314** may include server applications and/or mid-tier applications (e.g., HTTP (hypertext transport protocol) server applications, FTP (file transfer protocol) server applications, CGI (common gateway interface) server applications, JAVA server applications, etc.). Services **1316** are software components, modules, application, etc. that are configured to execute on cloud computing system **1312** and provide functionalities to client devices **1302-1308** via networks **1310**. Services **1316** may be web-based services or on-demand cloud services.

Databases **1318** are configured to store and/or manage data that is accessed by applications **1314**, services **1316**, and/or client devices **1302-1308**. For instance, storages **155-170** may be stored in databases **1318**. Databases **1318** may reside on a non-transitory storage medium local to (and/or resident in) cloud computing system **1312**, in a storage-area network (SAN), on a non-transitory storage medium local located remotely from cloud computing system **1312**. In some embodiments, databases **1318** may include relational databases that are managed by a relational database management system (RDBMS). Databases **1318** may be a column-oriented databases, row-oriented databases, or a combination thereof. In some embodiments, some or all of databases **1318** are in-memory databases. That is, in some such embodiments, data for databases **1318** are stored and managed in memory (e.g., random access memory (RAM)).

Client devices **1302-1308** are configured to execute and operate a client application (e.g., a web browser, a proprietary client application, etc.) that communicates with applications **1314**, services **1316**, and/or databases **1318** via networks **1310**. This way, client devices **1302-1308** may access the various functionalities provided by applications **1314**, services **1316**, and databases **1318** while applications **1314**, services **1316**, and databases **1318** are operating (e.g., hosted) on cloud computing system **1300**. Client devices **1302-1308** may be computer system **1100** or computing device **1200**, as described above by reference to FIGS. **11** and **12**, respectively. Although system **1300** is shown with four client devices, any number of client devices may be supported.

Networks **1310** may be any type of network configured to facilitate data communications among client devices **1302-1308** and cloud computing system **1312** using any of a variety of network protocols. Networks **1310** may be a personal area network (PAN), a local area network (LAN), a storage area network (SAN), a campus area network (CAN), a metropolitan area network (MAN), a wide area network (WAN), a global area network (GAN), an intranet, the Internet, a network of any number of different types of networks, etc.

The above description illustrates various embodiments of the present disclosure along with examples of how aspects of the present disclosure may be implemented. The above examples and embodiments should not be deemed to be the only embodiments, and are presented to illustrate the flexibility and advantages of various embodiments of the present disclosure as defined by the following claims. Based on the above disclosure and the following claims, other arrangements, embodiments, implementations and equivalents will be evident to those skilled in the art and may be employed without departing from the spirit and scope of the present disclosure as defined by the claims.

What is claimed is:

1. A non-transitory machine-readable medium storing a program executable by at least one processing unit of a device, the program comprising sets of instructions for:

receiving sensor data from a set of sensors, each sensor in the set of sensors configured to sense a physical quantity in an environment;

based on the sensor data, determining a set of configurations for a set of smart devices, wherein determining the set of configurations for the set of smart devices comprises:

performing a lookup on a table comprising mappings between sets of sensor data and sets of configurations for the set of smart devices;

based on the lookup, identifying a particular set of sensor data that matches the received sensor data; and

using a particular set of configurations in the sets of configurations to which the particular set of sensor data maps as the set of configurations for the set of smart devices;

wherein the set of smart devices comprises a set of smart emergency devices installed in a building, each smart emergency device in the set of smart emergency devices configured to provide emergency exit information to guide exiting the building; and

repeatedly sending the set of configurations to a set of system interface devices at defined time intervals, wherein each smart device in the set of smart devices is managed by a different system interface device in the set of system interface devices, wherein each smart device in the set of smart devices is configured to receive a particular configuration in the set of configurations from the system interface device that manages the smart device, wherein the set of system interface devices and the set of smart devices are separate devices.

2. The non-transitory machine-readable medium of claim **1**, wherein the configuration for the smart emergency device comprises instructions to provide information indicating whether an exit is safe to use.

3. The non-transitory machine-readable medium of claim **1**, wherein the set of sensors comprises a fire sensor configured to sense the presence of fire.

4. The non-transitory machine-readable medium of claim **1**, wherein receiving the sensor data from the set of sensors comprises receiving the sensor data from a system interface device configured to receive the sensor data from the set of sensors.

5. The non-transitory machine-readable medium of claim **4**, wherein the system interface device is further configured to receive the sensor data from a sensor interface configured to receive the sensor data from the set of sensors.

6. The non-transitory machine-readable medium of claim **4**, wherein, in response to receiving the set of sensor data from the set of sensors, the system interface device is further configured to generate a set of messages based on the set of sensor data, wherein the sensor data received from the system interface device is in the form of the set of messages, wherein each message in the set of messages comprises sensor data received from a sensor in the set of sensors and a sensor identifier (ID) associated with the sensor.

7. The non-transitory machine-readable medium of claim **1**, wherein determining the set of configurations for the set of smart devices further comprises updating stored sensor data with the received sensor data and determining the set of configurations based on the stored sensor data and stored smart device data.

8. A method comprising:

receiving sensor data from a set of sensors, each sensor in the set of sensors configured to sense a physical quantity in an environment;

based on the sensor data, determining a set of configurations for a set of smart devices, wherein determining the set of configurations for the set of smart devices comprises:

performing a lookup on a table comprising mappings between sets of sensor data and sets of configurations for the set of smart devices;

based on the lookup, identifying a particular set of sensor data that matches the received sensor data; and

using a particular set of configurations in the sets of configurations to which the particular set of sensor data maps as the set of configurations for the set of smart devices;

wherein the set of smart devices comprises a set of smart emergency devices installed in a building, each smart emergency device in the set of smart emergency devices configured to provide emergency exit information to guide exiting the building; and

repeatedly sending the set of configurations to a set of system interface devices at defined time intervals, wherein each smart device in the set of smart devices is managed by a different system interface device in the set of system interface devices, wherein each smart device in the set of smart devices is configured to receive a particular configuration in the set of configurations from the system interface device that manages the smart device, wherein the set of system interface devices and the set of smart devices are separate devices.

9. The method of claim **8**, wherein the configuration for the smart emergency device comprises instructions to provide information indicating whether an exit is safe to use.

10. The method of claim **8**, wherein the set of sensors comprises a fire sensor configured to sense the presence of fire.

11. The method of claim **8**, wherein receiving the sensor data from the set of sensors comprises receiving the sensor data from a system interface device configured to receive the sensor data from the set of sensors.

12. The method of claim **11**, wherein the system interface device is further configured to receive the sensor data from a sensor interface configured to receive the sensor data from the set of sensors.

13. The method of claim **11**, wherein, in response to receiving the set of sensor data from the set of sensors, the system interface device is further configured to generate a set of messages based on the set of sensor data, wherein the sensor data received from the system interface device is in the form of the set of messages, wherein each message in the set of messages comprises sensor data received from a sensor in the set of sensors and a sensor identifier (ID) associated with the sensor.

14. The method of claim **8**, wherein determining the set of configurations for the set of smart devices further comprises updating stored sensor data with the received sensor data and determining the set of configurations based on the stored sensor data and stored smart device data.

15. A system comprising:

a set of processing units; and

a non-transitory machine-readable medium storing instructions that when executed by at least one processing unit in the set of processing units cause the at least one processing unit to:

receive sensor data from a set of sensors, each sensor in the set of sensors configured to sense a physical quantity in an environment;

based on the sensor data, determine a set of configurations for a set of smart devices, wherein determining the set of configurations for the set of smart devices comprises:

performing a lookup on a table comprising mappings between sets of sensor data and sets of configurations for the set of smart devices;

based on the lookup, identifying a particular set of sensor data that matches the received sensor data; and

using a particular set of configurations in the sets of configurations to which the particular set of sensor data maps as the set of configurations for the set of smart devices;

wherein the set of smart devices comprises a set of smart emergency devices installed in a building, each smart emergency device in the set of smart emergency devices configured to provide emergency exit information to guide exiting the building; and

repeatedly send the set of configurations to a set of system interface devices at defined time intervals, wherein each smart device in the set of smart devices is managed by a different system interface device in the set of system interface devices, wherein each smart device in the set of smart devices is configured to receive a particular configuration in the set of configurations from the system interface device that manages the smart device, wherein the set of system interface devices and the set of smart devices are separate devices.

16. The system of claim **15**, wherein the configuration for the smart emergency device comprises instructions to provide information indicating whether an exit is safe to use.

17. The system of claim **15**, wherein the set of sensors comprises a fire sensor configured to sense the presence of fire.

18. The system of claim **15**, wherein receiving the sensor data from the set of sensors comprises receiving the sensor data from a system interface device configured to receive the sensor data from the set of sensors, wherein the system interface device is further configured to receive the sensor data from a sensor interface configured to receive the sensor data from the set of sensors.

19. The system of claim **18**, wherein, in response to receiving the set of sensor data from the set of sensors, the system interface device is further configured to generate a set of messages based on the set of sensor data, wherein the sensor data received from the system interface device is in the form of the set of messages, wherein each message in the set of messages comprises sensor data received from a sensor in the set of sensors and a sensor identifier (ID) associated with the sensor.

20. The system of claim **15**, wherein determining the set of configurations for the set of smart devices further comprises updating stored sensor data with the received sensor data and determining the set of configurations based on the stored sensor data and stored smart device data.

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